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This magazine is dedicated to the interpretation, in authentic and popular form, with extensive illustrations, of geography in its widest sense, first of Canada, then of the rest of the British Commonwealth and other parts of the world in which Canada has special interest.

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The British standard of spelling is adopted substantially as used by the Dominion Government and taught in most Canadian schools, the precise authority being the Oxford Dictionary as edited in 1936.

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Mineral Resources and Mining Activity in the Canadian Eastern Arctic*

by **J. LEWIS ROBINSON**

CANADA has two Northlands—the West and the East. The former has been geographically endowed with resources possible of development; the latter is a barren, bleak and little-developed region. The two regions are quite distinct and differ greatly in many respects. The problems which are met in opening-up and developing Canada's Western Northland are not the same as those which will be met in the Eastern Arctic. While it is possible to move about fairly freely in the Mackenzie Valley area during the summer and to a lesser extent during the winter, the Eastern Arctic is almost cut off from the rest of Canada during the winter, except for the god-send of radio. In the East, summer transportation facilities are different from those of the West and more limited by natural conditions.

The Eastern Arctic may be roughly defined as that part of Northeastern Canada north of the tree-line, which is serviced from the Atlantic and Hudson Bay. It comprises an area of about 700,000 square miles, including most of the numerous and large Arctic Islands, totalling about 19 per cent of Canada. In this area, about twice the size of the Province of British Columbia, or about equal to the area of Quebec and Manitoba combined, live about 150 white inhabitants and 6,000 Eskimo (79 per cent of the Canadian Eskimo population).

There are 30 tiny settlements within this region, approximately 100 to 200 miles from each other. Each of the settlements has a trading post which consists of four or five buildings. Many of them have no more than that, while others may have Department of Transport Radio and Meteorology Stations, Royal Canadian Mounted Police detachments, and church missions. The two hospitals at Chesterfield and Pangnirtung are normally attended by Government doctors. The largest settlements have from 25 to 30 buildings in all, including warehouses, outhouses and blubber sheds, and approximately 15 or 20 people is the greatest white population at any one place.

The region may be reached only by water or air, the dependability of both methods being influenced by natural conditions. The nearest railroads terminate at Churchill on western Hudson Bay, and Moosonee on southern James Bay. There are no roads within the area and no need for roads, since nearly all of the tiny settlements are located on the coast. Supplies and mail are brought into each of the posts during the short summer season, and communication during the rest of the year is by radio, with which each settlement is equipped. Air transport is still in its beginning stages and has been hampered by serious fog and icing conditions. Water transportation has been the only dependable way of reaching the settlements and it has been hindered at times by uncertain ice conditions in a short navigation season. From late October to late June the harbours are frozen over, and the sea-ice extends for several miles out from the coast. Drifting ice floes which reach the Atlantic through Hudson and Davis Straits may impede navigation at any time.

These are some of the problems of the Eastern Arctic, and illustrate why a study of the geography of the region is necessary to understand why it is so different from the rest of Canada, and why development has come slowly to the area.

The resources of the Eastern Arctic are limited. They are limited both in known quantity and quality, and also in relative accessibility to the more populated parts of Canada. The last Ice Age left the Eastern Arctic as an area of little possible agricultural development by virtually denuding it of soil. The

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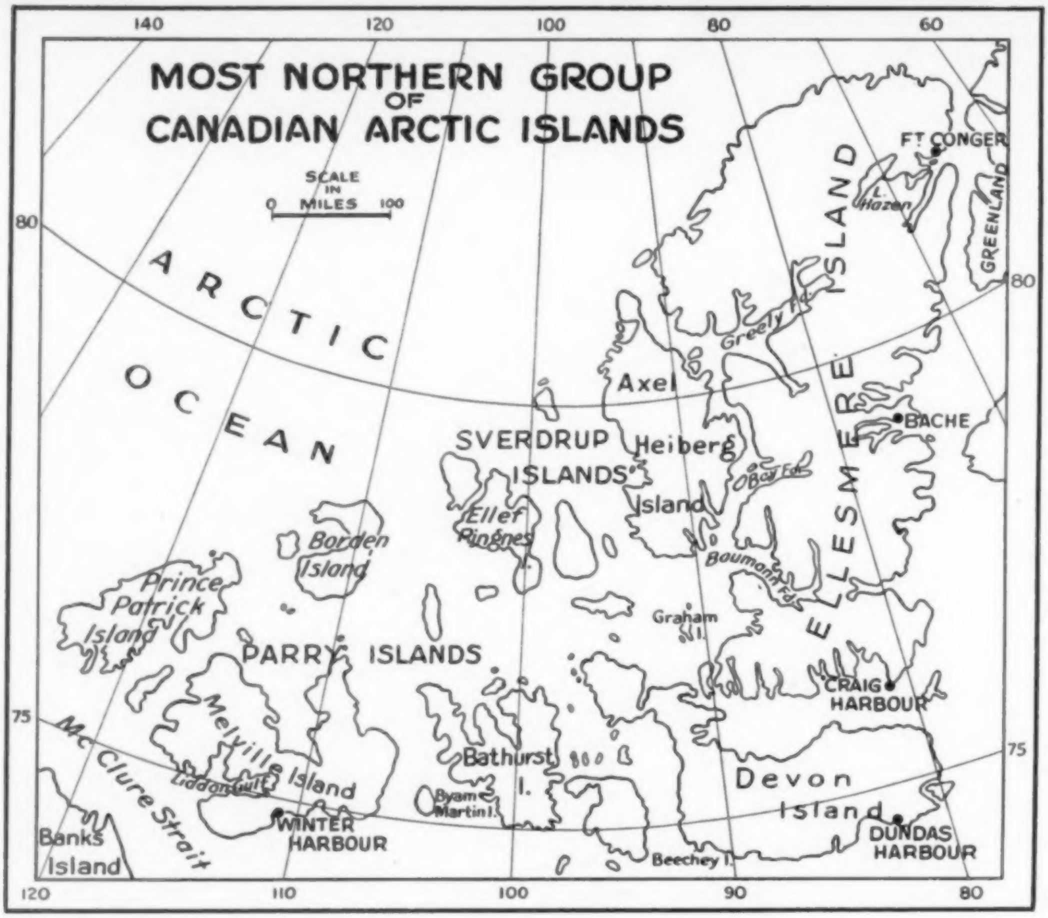
GEOLOGIC MAP OF THE CANADIAN EASTERN ARCTIC
SEDIMENTARY ROCKS
PALEOZOIC (undivided)
Cambrian
Ordovician
Silurian
Devonian
Carboniferous and Permian
TRIASSIC
TERTIARY
PRECAMBRIAN ROCKS
ARCHEAN granites, etc.
ARCHEAN volcanics and/or sedimentary
ARCHEAN and/or PROTEROZOIC sedimentary (Grenville type)
PROTEROZOIC sedimentary (including iron formation)
ICE CAP or PERMANENT SNOW FIELDS
GREENLAND
ELLESMERE
BAFFIN BAY
DEVON
Lancaster Sound
Pond Inlet
PRINCE OF WALES I.
SOMERSET
BOOTHIA PENINSULA
DAVIS STRAIT
BAFFIN ISLAND
Pangnirtung
FOXE BASIN
ARCTIC CIRCLE
FOXE CHANNEL
HUDSON STRAIT
SOUTHAMPTON ISLAND
Ungava Bay
Ft. Chimo
Chesterfield
QUEBEC
HUDSON BAY
Port Harrison
SASK.
MAN.
CHURCHILL
SCALE IN MILES
BELCHER ISLANDS

West coast of Hudson Bay. The low, swampy and lake-dotted character of the coast which extends westward from Hudson Bay makes overland travel by foot very difficult in the summer, while canoe travel is hampered by glacial drift which has cut off drainage. When this region is frozen over and snow-covered, sledge travel by dog-team is relatively easy.

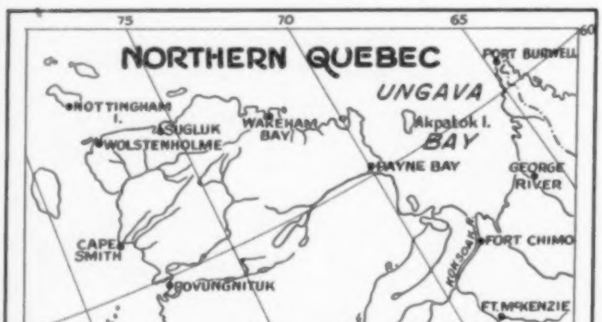
R.C.A.F. photos



present Arctic climate, influenced by the cold Labrador current flowing southward between Greenland and Baffin Island, has maintained the region as a generally "barren" land with no forest growth.

To the natives of the area, who comprise most of Canada's Eskimo population, the chief resource is the game of the land and sea. They hunt the caribou herds which migrate over a large part of the area, and use them for food and clothing. The Eskimo traps white foxes during the open season and trades the furs to the trading companies for ammunition, food, and utensils. An abundant sea life in the form of seals, walrus, white whales and fish supply food, dog-feed and clothing to the native population. For the limited Eskimo population of this vast region the game resources have been fairly adequate in giving them a relative self-sufficiency.

But what are the resources of the region which will attract interest from the rest of Canada and encourage development ? It has been true of many pioneer areas that mining has been the forerunner of future settlement, and, in the Mackenzie District of the Northwest Territories, it is one of the bases for economic development, when associated with other resources. In a region such as the Eastern Arctic, where other assets are either limited or lacking, mineral resources become important in estimating the value of the area; and a general knowledge of the geology of the



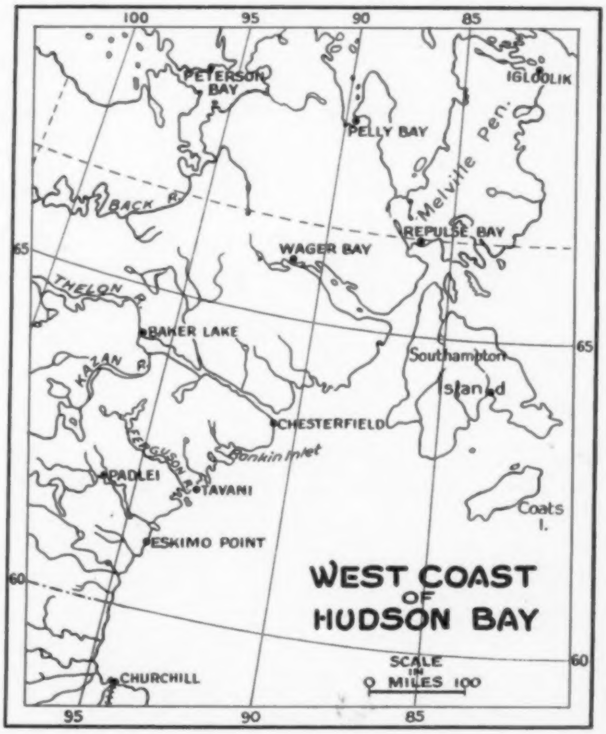
region is fundamental in understanding the mineral possibilities.

General Economic Geology

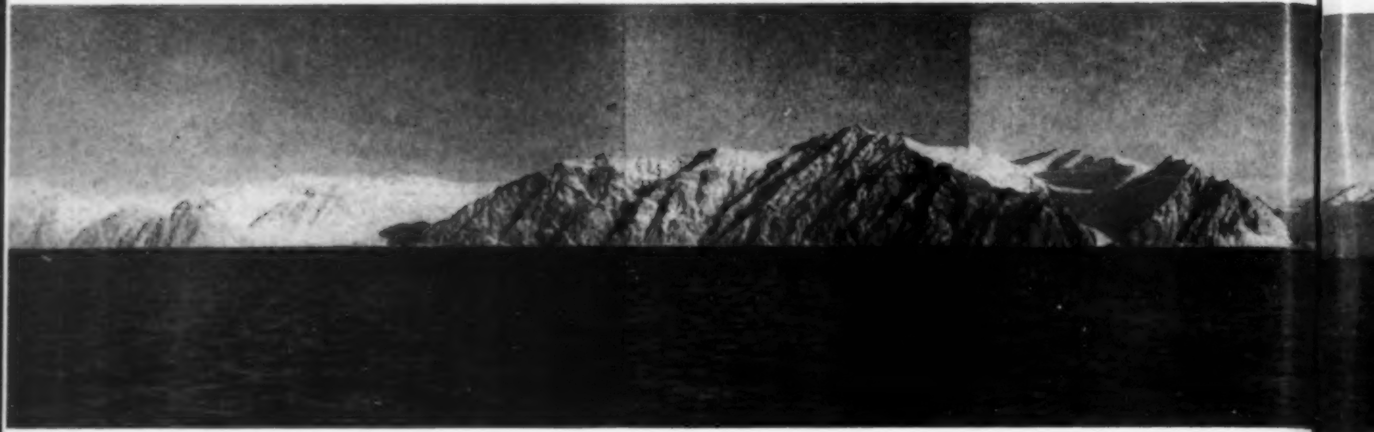
In any consideration of the economic mineral possibilities of the Eastern Arctic, basic factors of geologic structure and mineralization must share their importance with problems of accessibility, transportation and climate. Much of the area is underlain by Precambrian rocks of the Canadian Shield from which great wealth in rich minerals has been extracted in its southern and western sections. The ancient assemblages of sediments and volcanics, which occur amid the predominant granites and gneisses of the Eastern Arctic, resemble the rocks which are found in the southern part of the Shield. "Since these rocks in the Northwest Territories seem to be the counterpart of those to the south both as regards the kinds of rocks present and their relations with the invading igneous rocks, there is no known reason why they, too, should not be the sites of valuable mineral deposits." (1) Limited prospecting has shown this mineralization is present locally.

Although the fact that minerals are to be found is promising, it must be noted that to overcome the higher costs of transportation and development any finds must be proportionately richer than those in more accessible areas. Geologic knowledge has indicated that mineral wealth may be found, but economics and geography must determine whether these resources can or will be developed. Although information on the geology of the Eastern Arctic is based primarily on what has been observed along coastal strips, with interpretation for the interior areas, it is sufficient to take a broad view of the region in considering economic possibilities. Certain areas seem to be promising, while others can be ignored for several reasons.

The areas covered by ice caps or permanent snow-fields can be excluded from economic consideration. This includes several large sections in Ellesmere Island, most of Devon Island, much of the interior of Bylot Island, and scattered high or mountainous areas of Baffin Island. In Keewatin and Ungava Districts there are extensive areas, as yet not closely defined as to boundaries, which are covered by glacial drift. Prospecting is difficult or



(1) Stockwell, C. H. and Kidd, D. F., *Metalliferous Mineral Possibilities of the Mainland Part of the Northwest Territories*, Summary Report, 1931, Part C, Geological Survey, Canada, p. 71



South coast of Bylot Island

impossible in such areas because structure is hidden, and only drilling can reveal with certainty what lies below.

Sedimentary rocks of Palaeozoic age are found mainly in the central and western Arctic islands. Since the latest known period of widespread mineralization in Canada preceded the deposition of these sediments, rocks of this and later ages may be excluded as promising sources of metalliferous deposits. Such rocks, however, may still be considered as sources of coal, oil or gas. Most of the far northern islands, except the east coast of Ellesmere and Devon Islands, are included in this category. Similarly, large areas of sedimentary rock occur on Prince of Wales and Somerset Islands, Brodeur Peninsula and the central west coast of Baffin Island, the coasts of Boothia, Simpson and Melville Peninsulas, and the southwest half of Southampton Island.

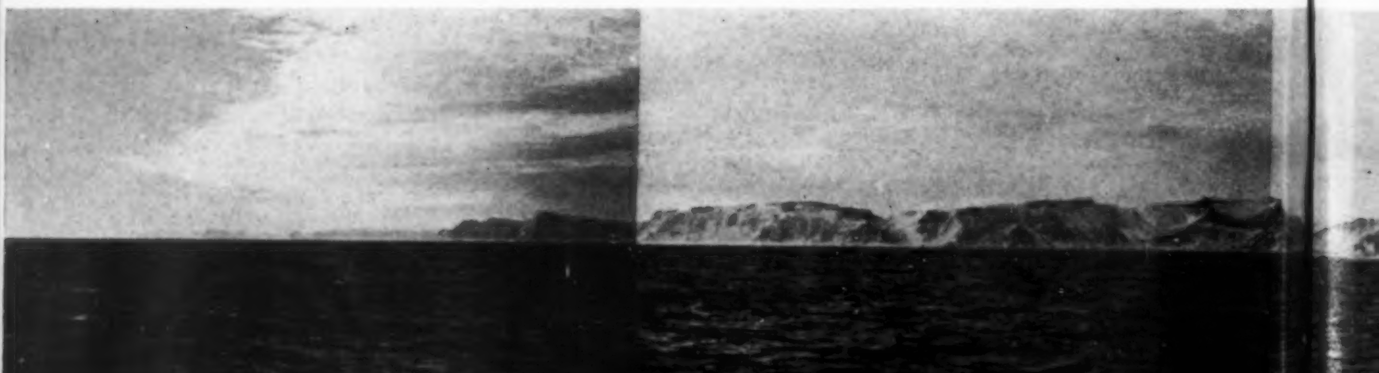
Inaccessibility by ship, because of ice conditions, prohibits much hope for the development of the Parry or Sverdrup Islands, unless large ice-breakers are used. In the same way, difficulties of sea-transport as a result of drifting ice in the very short navigation season makes mineral development unlikely along the east coasts of Ellesmere and Devon Islands.

Most of Keewatin and Ungava Districts and Baffin Island remain as areas of Precambrian granites, gneisses, schists, sediments and volcanic eruptives. These areas have been relatively well endowed both as to mineralization and accessibility. Here, also, lack of tree growth and soil leaves the rocks exposed to the prospector after many millions of years of weathering.

West Coast of Hudson Bay

Along the western side of Hudson Bay the coast is low-lying and generally flat. It is dotted with countless lakes which spill uncertainly one from another. The rivers and lakes which appear on the maps are chiefly the routes of early explorations, but from the air they may be difficult to pick out from the other numerous unmapped lakes and rivers which surround them. Coastal transportation is limited to small

Cape D[illegible] Baffin Is



Island on Pond Inlet

schooners along much of this low coast because of the shallow water and shoals which extend into Hudson Bay. In winter, travel is fairly easy by dog-team across the frozen, snow-covered surface, but in summer the myriads of lakes, swamps and intervening spongy muskeg confine travel chiefly to the rapid-infested rivers.

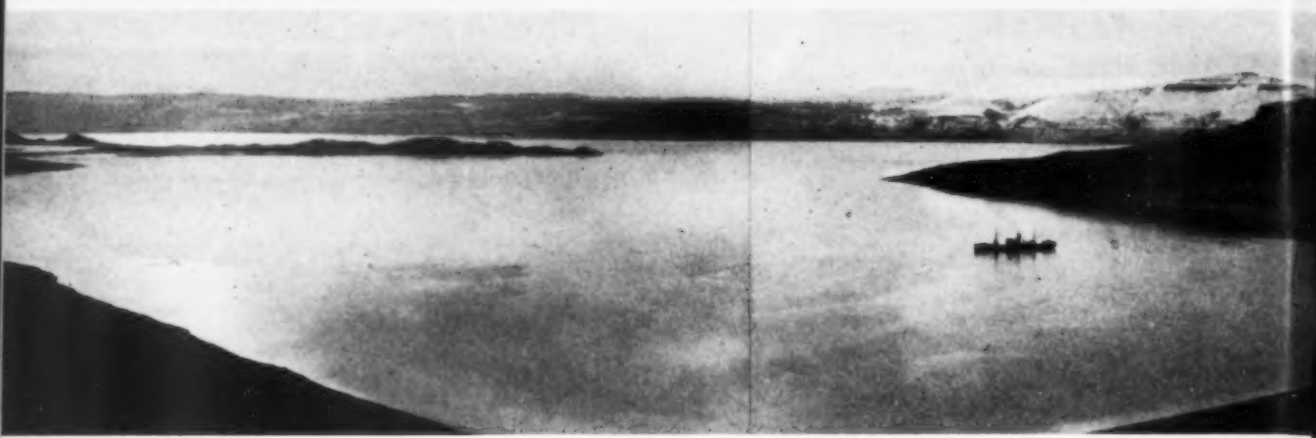
One of the most promising areas for mineral development lies between Eskimo Point and Chesterfield on the west side of Hudson Bay and inland as far as the Kazan River. The region, so far as is known, is mainly underlain by two divisions of rocks, both of Precambrian age. One group consists of granite and granite-gneiss, the other of volcanic and sedimentary strata.(2) Although the gneisses have produced mineral wealth in the southern part of the Shield, the granites have been found to be generally barren, and therefore it is likely that those of the northern region will be similarly lacking in economic minerals. The volcanics and sedimentary strata, on the other hand, are known to contain mineral deposits.

Although traces of gold and silver were first reported from this area in 1885 by Robert Bell of the Geological Survey of Canada, it can be said that intensive prospecting of the mineral resources did not start until 1928. At that time four major companies turned their attention to the Hudson Bay region and simultaneously explored the area with the use of canoes, supply ships and spectacular servicing by aeroplane. These companies were: Northern Aerial Minerals Exploration (N. A.M.E.), Dominion Explorers, Cyril Knight Prospecting Company, and Nipissing Mining Corporation.

During the spring of 1928 unsuccessful attempts were made to reserve large areas for certain companies. However, all started on an equal basis as soon as the ice broke up and the season opened. Late in July the N.A.M.E. ship *Patrick and Michael* and the Dominion Explorers' schooner

(2) Weeks, L. J., *Rankin Inlet Area, West Coast of Hudson Bay*, Summary Report, 1931, Part C, p. 40, Geological Survey, Canada.

Baffin Island



Arctic Bay, Baffin Island,

Morso entered Hudson Bay, but arrived too late in the season to allow for little more than preparatory work for the next season's activities. The *Patrick and Michael* was wrecked at the entrance to Baker Lake, but most of the equipment was saved and N.A.M.E. established their base and wireless station at the old Royal Canadian Mounted Police barracks near this place. The *Morso* brought material for a base and wireless station at Tavani and also delivered supplies safely to another base at Baker Lake. Planes were carried to the Bay on the ship, and later others flew in to join the Dominion Explorers' expedition.

The Nipissing Mining Corporation sent canoe parties into the area west of Hudson Bay. One came via Great Slave Lake and the Thelon River and the other by rail to Churchill and thence along the coast. The Cyril Knight Company used canoes for exploration and aeroplanes to service their parties.

In the 1928 season, investigation was limited chiefly to the coast, with exploratory flights inland. Only two locations were staked: gold at Term Island by the Nipissing party, and pyrrhotite at Rankin Inlet by the Cyril Knight Company. Mineralization was noted at several scattered places, but occurrences were small.

During the winter N.A.M.E. maintained their base at Baker Lake, while the Dominion Explorers' party stayed at Tavani. The latter group made a difficult flight to Baker Lake, but abandoned further attempts at winter flying. They also tried to move freight by tractor north from Churchill over the sea-ice along the coast.

Early in the spring of 1929 men and planes gathered at Churchill and started an early season of reconnaissance. Spring mists hung over the land most of May, hindering ski-plane observations, and then in late June flying was suspended until the ice on the lakes broke up. Ground

Cape Smith, on Smith Island east side

Island, Northwest Territories

parties could do little prospecting work until the end of June, when the surface was free of snow.

The Nipissing and Knight companies confined their summer activity chiefly to proving and developing their claims on Term Island and on the north shore of Rankin Inlet. The other two companies continued aerial exploration and servicing of their ground parties, who were scattered from Eskimo Point and Padlei on the south to Repulse Bay on the north, and as far inland as the Kazan and Thelon Rivers.

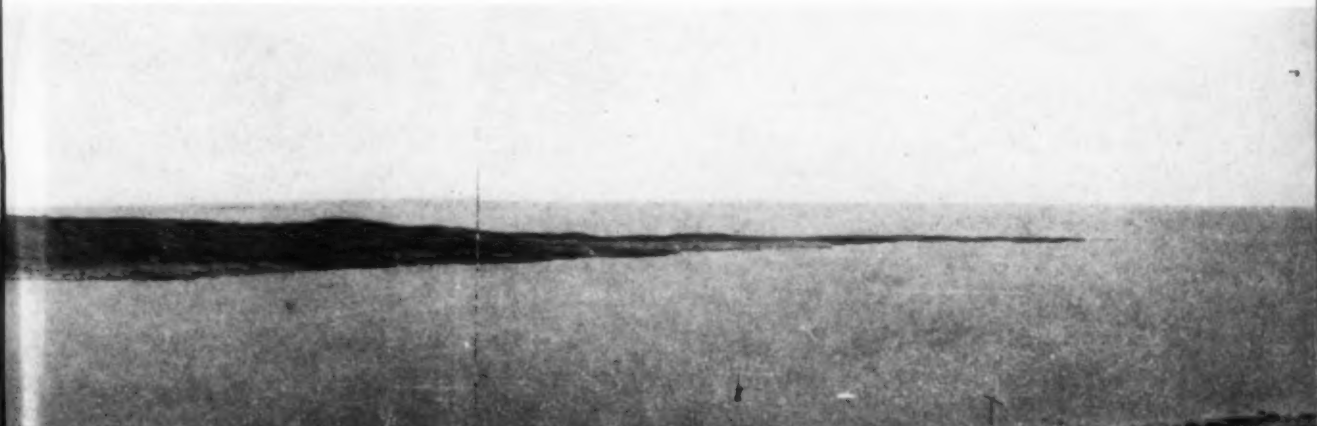
The Nipissing Mining Corporation located and prospected a mineralized shear zone near the contact between the volcanic rocks and granite on the northeast side of Term Island. Free gold, accompanied by pyrite and chalcopyrite, was found in quartz and silicified greenstone. A small open cut was hand-picked and about 1,100 pounds were shipped out. This proved to be the extent of the deposit.

Work of Dominion Explorers covered a broad stretch of low-lying coast south of Chesterfield in which rock exposures are meagre due to glacial drift, and where little could be done without more intensive study than was possible at the time. The more rugged country north of the inlet was found to be largely unpromising granites or gneiss.

Late in the summer the MacAlpine party in a Dominion Explorers' plane was forced down on the Arctic Coast, and were cared for by Eskimo until Dease Strait froze over, when they were guided to the Cambridge Bay trading post on Victoria Island. In the widespread searching operations carried on by plane for the missing party, much more of Keewatin and eastern Mackenzie became known by aerial reconnaissance.

During the 1929 season no new finds of importance were made in the Hudson Bay area, and in the following year the two aerial companies turned their attention to the Coppermine River area. Although

east side of Hudson Bay



Cape Dorset, Baffin

the Hudson Bay activity was ambitious for that time, it was barren of economic returns. The costly adventure was useful chiefly in giving valuable experience, which helped in future operations in the Mackenzie District, and in pointing out some technical problems that had to be overcome in the planes of that time. Large sums of money were spent in two seasons of investigating the Hudson Bay area, but no economic deposits were discovered; the only claims staked were by the two companies who used more conservative methods.

The conclusion stated by Guy Blanchet, who was one of the leaders of the Dominion Explorers' field party, was that, after two years of intensive prospecting on a large scale, "Where the exposed rock was of a character that might lead to the expectation of mineral deposits, the lack of intrusive bodies and structural disturbances discouraged the hope of finding anything important".(3) However, much of the country rock was covered by glacial drift that hampered prospecting, so that these operations do not necessarily prove the country worthless for mining. Exploration has shown that the area is definitely mineralized, and it remains for future investigation to attempt to discover commercial deposits.

The Cyril Knight Prospecting Company was the only party to return to the west coast of Hudson Bay in 1930. Diamond drilling during that season showed that their claims at Rankin Inlet contained a mineral body which is a sulphide ore intruded between sedimentary and volcanic rocks, containing considerable pyrrhotite

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(3) Blanchet, G. H., *Preliminary Report on the Aerial Mineral Exploration of Northern Canada*, Dept. of the Interior, 1930

Three scenes of Cumber

Dorset, Baffin Island

with a little chalcopyrite, pentlandite and pyrite. In one place the mineralization extends beneath the sand and gravel of the shore.

The Company estimated that a profit could be made by shipping out the 30,000 tons of indicated high grade ore to a smelter, but, unless more than 200,000 tons of medium grade ore could be uncovered, it would not pay to build a concentrator on the location. It was further estimated that one million tons would have to be found to justify the construction of smelting and refining facilities at the ore body. In 1931, however, the Cyril Knight Company claimed that owing to the remoteness of the area, the lack of transportation, and the depressed condition of the base metals market, further development of the mineral deposits at Rankin Inlet was inadvisable, and requested that the area be withdrawn from the representation provisions of the Quartz Mining Regulations.(4) In June, 1931, due to general adverse conditions, a moratorium was created in the whole Northwest Territories relating to representation work. This moratorium expired in October, 1933, and claim owners again had to work on their claims to maintain them in good standing.

In 1935, International Nickel representatives flew in to Rankin Inlet with Cyril Knight to investigate the property. In 1937, due to the fact that some of their claims were expiring unless additional work was carried on, the Knight Company

(4) Any licensee who has recorded a mineral claim is entitled to hold it for one year provided that he performs work on the claim to the value of at least one hundred dollars. Any excess may be credited to subsequent years.

enes of Cumberland Sound

R.C.A.F. photos

decided to prove up the deposit thoroughly for its size and economic possibilities.

In mid-April, 26 tons of mining material, including drill equipment and a radio station, were carried by ski-equipped planes from Churchill to Rankin Inlet. They planned to ship in further mining equipment by boat when the navigation season opened, after obtaining drilling results. Their plans thus utilized the advantages of both air and water transportation. Drilling lasted from May to July, and when the results indicated that the mineral body was not of a substantial tonnage, the ship did not sail with the further equipment. The report of 2,413 feet of drilling operations showed that the ore body pinched out and was only 350 feet long and 100 feet deep. The Company's engineer in charge reported that "it is believed that sufficient drilling has been done to indicate that the body is limited in extent".

Other individuals and companies have investigated the mineral possibilities of Keewatin District within recent years. A private prospector from Churchill staked some claims near Padlei in 1938. In the summer of 1941 the Hudson Bay Mining and Smelting Company flew a group of prospectors north to Padlei and from there they spent the season investigating the area. Previous to that the Company had already quietly carried on two years of extensive mapping and reconnaissance geology. However, no claims were filed as a result of their work.

During the summer of 1942, several prospectors of the Hudson Bay Exploration and Development Company explored the area west of Hudson Bay, between latitudes 60-63° north, and as far west as longitude 99°. The Company staked four widespread claims within this region.

East Coast of Hudson Bay

Ungava Peninsula of Northern Quebec is a rolling plateau area which rises rather abruptly along the eastern Hudson Bay

Top to bottom:—

Hudson Bay post, Lake Harbour
R.C.A.F. photo

Arctic Bay, Baffin Island, September, 1943

Wolstenholme, Ungava, Quebec, August, 1943

River Clyde, Northwest Territories, October, 1943

Pond Inlet post, Baffin Island, October, 1943

and southern Hudson Strait coasts to altitudes of 1,000 to 2,000 feet, and slopes down toward Ungava Bay. North of the tree-line, which roughly extends from southern Ungava Bay to Richmond Gulf on Hudson Bay, the surface is one of broad, alluvial and gravel-filled valleys between low ridges of bare rock. This area is similar to the west coast of Hudson Bay in that it is also underlain by the old Precambrian rocks which comprise the foundations of about two-thirds of Canada.

At the same time as the area on the west coast of Hudson Bay was being investigated, similar prospecting activity was being carried on along the east coast of the Bay. In 1928 N.A.M.E. staked several claims in the area of Little Whale River, searching for an extension of the lead deposits which had been mined there by the Hudson's Bay Company as early as 1749. They also sent two men inland to investigate native reports of copper and lead deposits. No further action was taken by the Company.

In the years 1931-32 a greenstone belt that extends into Ungava District from Cape Smith was prospected by several companies, led by the Cyril Knight Prospecting Company. Mineralization had been first reported from here, in 1900, by A. P. Low of the Geological Survey. The prospectors found the belt to be 40 miles broad, and they explored it inland for 150 miles. Mineral showings were located on Smith Island and the nearby mainland. In 1933 prospectors and supplies were transported by plane from Moosonee, and a more intensive study was made of the discoveries.

The greenstone belt,(5) probably early Precambrian in age, consists of altered lavas, and some sediments, all cut by diorite dykes. The area is bordered to the north and south by granitic and gneissic rocks. The rocks of most of the belt are intensely folded, with a generally north-east strike. Some of the pillow lavas are sheared and faulted.

The mineral showings are sulphide deposits which consist of massive, fine-grained pyrrhotite cut by veinlets of coarser pyrrhotite, associated in places with small amounts of chalcopyrite. Assays indicated, however, that the gold content of the quartz veins is either nil or so low as to be of no commercial value, while only traces of copper and nickel were found in the sulphides. The Knight Company decided that the mineralization of the whole greenstone belt was probably all of the same uniformly low grade and no further work was done.

Exploratory work has thus shown that mineralization occurs throughout this area, but testing of one section has shown that the sulphide bodies are much too low grade to encourage development. It is quite possible that the same condition applies to the whole greenstone belt, but only further prospecting can determine this. "The belt has been barely explored, not to say prospected, and it compares favourably in size with any of the larger areas of similar rocks that, throughout the Canadian Shield, are generally considered to constitute favourable ground for prospecting."(6)

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(5) Gunning, H. C., *Sulphide Deposits at Cape Smith, East Coast of Hudson Bay*, Summary Report, 1933, Part D, Geological Survey, Canada

(6) Gunning, H. C., op. cit. p. 154D

An iron formation of Proterozoic age found in the Nastapoka Islands and Richmond Gulf area of the mainland on the east side of Hudson Bay has been known for a long time.(7) Iron formations hundreds of feet thick were described by C. K. Leith in 1910.(8) Since then many of the leading steel companies have sent men into the area to look over the deposits carefully, and all have agreed that none constitute iron ore under present conditions. Seven of the islands of the Nastapoka group have been patented to two companies (in 1903 and 1916) giving rights forever to the surface and all base minerals except coal. No development work has been done on the iron formation. The other islands of the group have not been surveyed and are available for disposition under the Quartz Mining Regulations. These late Proterozoic sediments, however, hold little hope for finds of precious metals.

The Belcher Islands, located about 60 miles off the east coast of Hudson Bay, are a maze of narrow islands cut by long arms, bays, inlets and sounds. Their broken hills and long, low, black ridges are the eroded tops of submerged ranges which appear again northward in the Sleeper and King George group of islands.

An iron formation similar to that which was known in the Nastapoka area was investigated by R. J. Flaherty in 1916. When E. S. Moore reported on the iron, in 1918, he stated that he saw no ore of commercial value but that there was a large reserve of iron formation.(9) He found 39 feet of iron oxides mixed with jaspilite in bands and therefore very difficult to extract.

A more comprehensive study was made by G. A. Young in 1921.(10) He reported that "no iron ore of commercial value, under existing conditions, was seen. Highly ferruginous zones were found, and, where exposed, there were always two or more zones in evidence. Thickness of zones varied from 10 to 50 feet, with a total thickness of 365 feet."

"Examination of the material itself indicated that the zones are composed almost wholly of silica and iron oxides. The silica is largely in the form of quartz, the iron oxides in the form of magnetite and hematite, but a small proportion of the silica and iron oxides is combined as an iron silicate. In four samples tested, silica varied from 32-46 per cent. By hand-picking these layers the metallic iron content could be raised to 50 per cent, or more, but the silica content would still be greater than 20 per cent, and this hand-picking process would be expensive."

Young pointed out that the formation is similar to that forming the rich Mesabi Range of Minnesota, and that it is possible that ore bodies may be hidden by the glacial drift mantling the islands.

In 1928 the N.A.M.E. Company did some surface work and drilling in the iron deposits of the Belcher Islands. They found that some of the exposures contained as much as 48 per cent iron and that the ore was low in phosphorus. The Company, however, withdrew from the area due to difficulty of transportation to markets.

Most of the iron formation of the Belcher Islands has been leased to Belcher Islands Iron Mines Limited. In 1940, the Company claimed that "a suitable process for the development of the iron ore on the locations has been secured, and in spite of low grade ore and the remoteness of the Belcher Islands from markets, the Company is satisfied that, with further expenditure, an iron mining industry may be established". However, the Company has been unable to obtain priorities for steel equipment or the necessary labour to do very much work on the property since then.

In 1940, the Ore Dressing and Metallurgical Laboratories of the Department of Mines and Resources tested a sample of hematite from the Belcher Islands. They found that it contained 43 per cent iron and 29 per cent silica. The percentage of iron is relatively high, and is very finely crystalline. Ten per cent silica, however, is usually the limit for commercial development. The laboratories found that it was very difficult to separate the ore from the gangue by the common methods of concentration, and reported that "this iron formation does not seem suitable for commercial recovery of iron".

Thus, the iron of the Belcher Islands can be classed as an iron formation, but,

(7) Low, A. P., *Geology and Physical Characters of Nastapoka Islands*, Geological Survey of Canada, Vol. 13, Part D, 1900
(8) Leith, C. K., *Algonkin Basin in Hudson Bay, Economic Geology*, Vol. 5, 1910
(9) Moore, E. S., *The Iron Formation of Belcher Islands, Hudson Bay, Journal of Geology*, Vol. 26, 1918, pp. 412-438
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Richmond Gulf. Iron formations are exposed here in the tilted Proterozoic strata between Richmond Gulf and the east coast of Hudson Bay. This is near the southern limit of the Eastern Arctic, and has small trees growing in the sheltered valleys.

R.C.A.F. photos

so far as known, not as a deposit of iron ore under present conditions.(11) However, the islands have not been fully prospected, and higher grade deposits may yet be found. Though iron is present in large amounts, technological problems prevent it from being economically important at present. When this factor is combined with general inaccessibility and present lack of transport to the Belchers, it becomes evident that ores in more accessible places will be used before the reserve wealth of the islands becomes necessary.

In the interior of Ungava District on the Quebec-Labrador boundary, in the vicinity of Hamilton Falls, a large deposit of iron ore has recently been explored. Field work has demonstrated that ore is definitely present in large quantities. These deposits have been traced discontinuously as far north as Fort McKenzie. Rocks of a similar age continue north along the Koksoak River past Fort Chimo, where traces of iron formation were noted by A. P. Low in 1895.(12) Whether deposits with the grade of the Labrador ore occur this far north into the Eastern Arctic is not yet known.

Baffin Island

Baffin Island is the largest of the Canadian Arctic islands. Its area of slightly over 200,000 square miles is about equal to the area of the Province of Manitoba. The high mountain range which extends along its whole northeast coast from Pond Inlet to Cumberland Sound is the highest range of Eastern North America, with altitudes of 10,000 feet having been recently noted by aeroplanes crossing the area. Picturesque scenery reminiscent of Switzerland, is found in the long glaciers, deep fiords, and serrated ridges of this east and northeast coast, which rises majestically directly from the water. The south coast is lower and less spectacular. It rises steeply from the water in a drab, bare-rock surface to altitudes of about 1,000 feet and extends inland as a general rolling plateau of about 2,000 feet elevation. On the northern side the upland slopes down toward the broad tundra lowland west of Amadjuak and Nettilling Lakes.

The south and east coasts of Baffin Island hold possibilities of mineral wealth. Discoveries of mica, graphite and garnet have been noted at several places. However, most of the known minerals of the area are non-metalliferous, and occur either in small or low grade deposits. Their lack of value has prevented them from playing a part in the world market. The whole indented south and east coast of Baffin Island is accessible from the Atlantic for several months of the year, and although present known deposits have been of no value, the fact that mineralization has occurred should point the way to future investigation.

Attempts to utilize the mineral resources of southern Baffin Island have been unsuccessful. In 1876 an American took a large load of mica from the Cumberland Gulf area, reported to be worth $120,000; and in the early part of this century the Hudson's Bay Company mined the graphite of Blacklead Island. The Hudson's Bay Company also shipped a small tonnage of graphite from Lake Harbour in 1917-18. Following World War 1, the Hudson's Bay Company shipped both mica and garnet from Lake Harbour to England, but the project was soon dropped.

The Admiralty Inlet area, centring around the post of Arctic Bay in northern Baffin Island, is considered to be a promising prospecting area. Here faulted and folded Precambrian and lower Palaeozoic sediments have been cut by several dykes of gabbro and basalt. Mineralization is known to have occurred along the contacts. Gold, silver, platinum, copper, iron, nickel and antimony were found in small quantities by Captain Bernier's exploratory parties in 1910-11. Against the favourable facts of good structure and known mineralization are the problems of long distance from markets, a short and uncertain navigation season, and incomplete knowledge of the area.

An attempt was made to prospect the Arctic Bay area in 1937. J. F. Tibbett, geologist, accompanied by F. McInnes, a retired Royal Canadian Mounted Police officer, travelled by dog-team in the spring from Churchill to Arctic Bay via Chesterfield and Repulse Bay. They were delayed on the way and reached Arctic Bay only a short time before the *Nascopie* arrived on the Eastern Arctic Patrol to take them out again. The men found that snow cover hindered the work, and their time was too short for adequate reconnaissance. They staked two claims each, but did not renew

(11) Tanton, T. L., Iron Geologist at the Mines and Geology Branch, Dept. of Mines and Resources, Ottawa
(12) Low, A. P., *Report on Explorations in the Labrador Peninsula*, Geological Survey of Canada, 1895

Two striking air views of Baffin Island. Note the triple glacier in the upper photograph.

R.C.A.F. photos

Akpatok Island, Ungava Bay, provides striking example of sedimentary rock;

R.C.A.F. photos

Falls, Fort-McKenzie, Quebec

them. On his return Tibbett was quoted as saying, "There is plenty of mineralization and unusual rock formation, and conditions are favourable for prospecting". (13)

Numerous fair-sized quartz crystals from the vicinity of Isabella and Home Bays in east Baffin Island were found by Eskimos who gave them to D. A. Nichols of the Mines and Geology Branch. Because of their scarcity and importance, future investigation may show these crystals to be of value, if they prove large enough for cutting.

In a land devoid of wood and developed water power, the numerous coal deposits of the Arctic islands may be of value in the future. The Tertiary lignite of Salmon River, near Pond Inlet, northern Baffin Island, has been known and utilized for several decades. The first recorded use was 155 tons which Captain Bernier mined in 1910 for use by the C.G.S. *Arctic* in her northern patrols. Captain Henry Toke Munn also used the coal at his trading-post at Pond Inlet in 1920. In 1924 the Hudson's Bay Company began to mine coal from a seam about three miles upstream on the east bank of the Salmon River. The workings of Captains Bernier and Munn were about a mile downstream from this, but had caved in.

In 1924, L. J. Weeks, of the Geological Survey, investigated the coal deposits and reported that there are two main seams, 3½ feet thick, about 18 feet apart, with the intervening rock usually containing several minor seams of one to two inches.(14) The beds are horizontal, or nearly so. When mined, this coal breaks into irregular lumps without signs of cleavage, and tends to crumble once it is left in the open. The associated sandstone beds weather so easily that the coal is exposed only where the river is actively undermining its banks. Coal exposures have also been found inland along the sides and tops of knolls, suggesting continuation of the beds. The coal is again exposed at the coast, on Eclipse Sound, about one mile west of the mouth of the Salmon River.

An analysis showed a low percentage of volatile matter and a fairly high fixed carbon content for a lignite coal. Although chemically the coal could be rated as of good quality, its physical property of easy crumbling makes transportation difficult. Attempts were made several years ago to ship the coal to River Clyde and Pangnirtung, but it crumbled so greatly that it was of little value upon arrival. Since the coal has a high heat value, briquetting is a possible method of shipment.

The coal has been used continuously by the Hudson's Bay Company post at Pond Inlet since 1924, and recently the Anglican and Roman Catholic missions also obtained permits to mine it. An Eskimo who is acquainted with the mining method can remove about 800 pounds of coal a day for the Hudson's Bay Company, using a little blasting powder and a long-handled steel drill. A total of about 50 tons is mined annually by the three parties of the settlement and transported to the post by dog-team.

The coal is usually mined in April, since it is neither hard-frozen nor soft, and can be chiselled out in larger lumps than at any other time of year.(15) It is impossible to mine during May and the summer months due to a steady stream of water running over the seams down the bank of the river, making the coal soft and crumbly. The coal is bagged and stored in a dry building, where wastage caused by crumbling and slacking during the summer is approximately 20 per cent. If it is left in bulk and exposed to the weather wastage is about 60 per cent. The coal burns well and gives out good heat as long as it is sifted and all dust removed.

Other Canadian Arctic Islands

In the Carboniferous rocks of the Parry Islands a high grade lignite or subbituminous coal is known to crop out in many places, and was utilized by early exploratory expeditions. Although not adequately examined, the fact that the coal is of the same general age as some of the world's great coal fields is suggestive. The value of this fuel to any future outpost or meteorological station, to which transportation will be exceedingly difficult, is obvious. Other coal deposits of the Arctic islands are generally of low grade, but being in an area where freight is expensive and fuel a necessity, they may become important.

Most of the western and northern Arctic islands may be geologically favourable for petroleum.(16) Meagre as our

(13) *Toronto Daily Star*, September 29, 1937
(14) Weeks, L. J., *The Geology of Parts of the Eastern Arctic*, Geological Survey, Summary Report, 1925, Part C
(15) Swaffield, A. T., H.B.C. Post Manager at Pond Inlet, 1940-43. Personal information
(16) Pratt, W. E., *Oil Fields in the Arctic, Harper's Magazine*, Vol. 188, Jan. 1944, pp. 107-112

information is, we know that they are composed of sedimentary rocks, containing organic remains, ranging in age from Ordovician to Triassic. Recent investigations in southern Ellesmere Island show that the Silurian and Devonian rocks alone attain a thickness of 8,000 feet. Seepages of petroleum (or bituminous seepages) have been reported on northern Melville Island, and further exploration may reveal others. It is possible that the Arctic islands may produce oil similar to that now known in the Mackenzie River Valley and along the north coast of Alaska.

Summary

Any prospecting or mining activity which is carried on in the Eastern Arctic faces serious problems. General exploration costs are much higher than in some other areas of Canada because of relative inaccessibility and lack of all-year dependable transportation. Fuel and power have to be imported, thus increasing costs. Most of the area has not been mapped geologically, and information on structure is poor in many places. Much of the areas of low-relief topography, where movement is not too difficult, is covered by glacial drift, burying rock exposures. Moreover, the ground is permanently frozen a few feet below the surface, making trenching very difficult.

The Eastern Arctic is not an easy country to develop. It is different from any other part of Canada and has distinctive problems of topography, climate, ice conditions and transportation. Plans for exploiting the resources of the region will have to consider these matters before definite action can be taken. If one thinks of development in terms of exploiting the natural resources of any one area to the advantage of Canada as a whole, the mineral possibilities are the chief attraction of the Eastern Arctic.

Although incomplete knowledge of the geology of the area indicates the possibility of mineral resources, wealth will be hard to win. Mineralization is known in several widely-scattered places, but so far mining activity has been unsuccessful in locating mineral deposits of present economic value. The area is vast, however, and prospectors have covered only small sections of it. The old Precambrian complex which has supplied wealth to the more accessible areas of Canada may yet bring changes to the Eastern Arctic. The aerial photographs which are now being taken of the region will greatly assist future prospecting and map-making. Whether present mineral indications are the limits of development or point the way to future wealth is left for geologic investigation to determine.

The following is a list of all known mineral occurrences in the Eastern Arctic. It is a compilation of *occurrences* only, with no statement as to size or grade. In many places they are simply traces or small discoveries, often reported by untrained men. The purpose of the list, however, is to summarize what is known, show where mineralization has occurred, and point out areas where future investigation might be profitable.

Keewatin District

Rankin Inlet	Nickel, copper, platinum in pyrrhotite
Term Island	Gold, molybdenite
Corbet Inlet	Pyrites, copper, arsenic
Mistake Bay	Copper
Ferguson River	Gold
Rabbit Island	Arsenic
Baker Lake	Pitchblende, fluorite
Wager Bay	Gold
Belcher Islands	Iron

Ungava District

Port Burwell	Graphite
Koksoak River	Iron
Wakeham Bay	Garnet
Cape Smith	Pyrrhotite, copper, pyrite
Port Harrison	Silver, lead, soapstone
Richmond Gulf	Iron
Nastapoka Islands	Iron
Little Whale River	Silver, lead, copper

Baffin Island

Cape Dorset	Mica, copper
Nuwata	Asbestos
Chorkbak Inlet	Garnet, magnetite, pyrites
Lake Harbour	Mica, graphite, garnet, lazurite
Cyrus Field Bay	Copper, iron, phosphorous, pyrites
Cumberland Gulf	Mica
Blacklead Island	Graphite
River Clyde	Mica, iron pyrite
Isabella and Home Bays	Quartz crystals
Salmon River (Pond Inlet)	Coal
Milne Inlet (Phillipp's Creek)	Mica

Baffin Island

Moffett Inlet	Mica
Yeoman's Island	Mica
Arctic Bay	Gold, silver, copper, platinum, nickel, antimony, iron, gypsum
Piling	Lignite

Bylot Island

Cape Hay	Lignite
Canada Point	Lignite
Cameron Point	Hematite
S. W. Bylot Island	Magnetite

Somerset Island

Fort Ross	Gold-bearing pyrite

Northern Melville Island

	Petroleum (bituminous) See pages

Coal in Other Arctic Islands

Axel Heiberg Island	Mokka Fiord
Banks Island	Rodd Head, Cape Crozier, Cape Hamilton
Bathurst Island	Scoresby Bay, De la Beche Bay, Sargent Point, Schomberg Point
Ellesmere Island	Fosheim Peninsula, Baumann Fiord, Stenkul Fiord, Bay Fiord, Graham Island, Cape Murchison, Lake Hazen, Fort Conger, Watercourse Bay, Franklin Sound
Melville Island	Liddon Gulf, Winter Harbour, Cape Dundas, Bridgeport Inlet, Skene Bay
Byam Martin Island	
Edmund Walker Island	
Prince Patrick Island	

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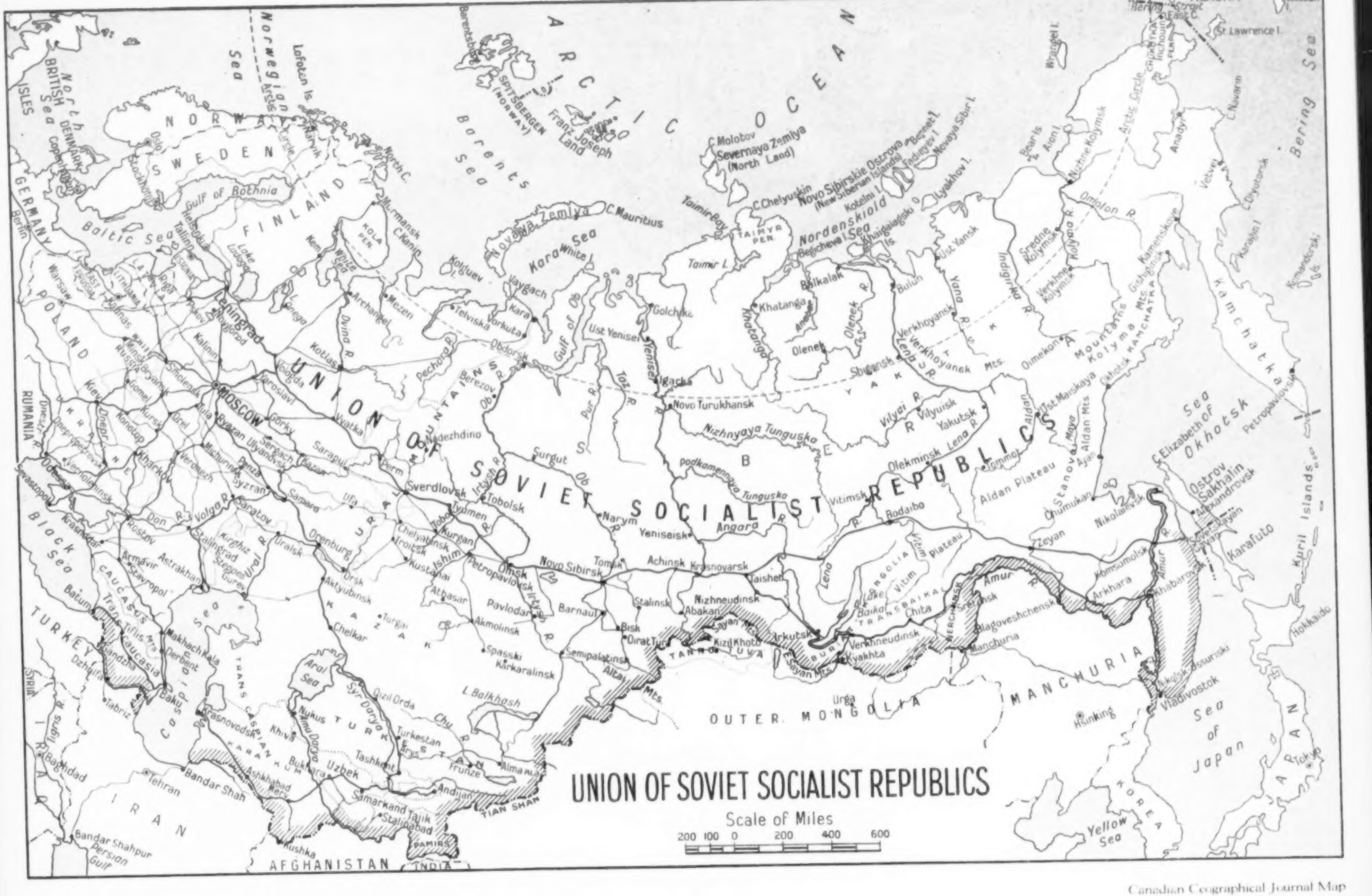


Canadian Geographical Journal Map

Geology in the U.S.S.R.

by **VLADIMIR OBRUCHEV**

THE geological and geographical study of the extensive territory of Russia was begun in the eighteenth century by a number of large expeditions organized on the orders of Peter I by the Academy of Sciences and the Admiralty—the first being the Messerschmidt expedition to the Tomsk and Lower Tunguska regions, two expeditions under Behring, in which Gmelin and Krasheninnikov took part, to Northeastern Siberia and Kamchatka and the voyages of the Laptevs, Pronchishchev, and other sailors along the coasts of the Arctic Ocean. Later followed the big expeditions of Pallas, Georgi, Lepekhin, Falk and their colleagues in the Volga Basin, the Urals, and into Siberia as far as the Altai Mountains and the district of Nerchinsk. All these large-scale expeditions, in which foreign scientists who had been invited to Russia took part along with the Russians, collected the first information on the geography, geology, botany, zoology and ethnography of the state, and published a number of comprehensive papers.

During the first thirty years of the nineteenth century the following are worthy of note: Severgin's papers on mineralogy, Pallas' work in the Taurida Peninsula, Adams' expedition in search of mammoth at the Lena River mouth, the expeditions of Anjou and Hedenstroem to the Novosibirsk Islands, of Wrangel and Sarychev to the Chukotka Peninsula and the coast of the Arctic Ocean, and Erman's travels throughout Siberia to Kamchatka. In the 30's mining engineers began working in the Altai and Nerchinsk districts of Siberia, producing the first geognostic maps; Baer and Karelin studied the shores of the Caspian Sea; and Karelin and Guenet studied the Kirghiz Steppes. The 40's of the last century saw the important expeditions of Kovalsky and Hofmann in the North Urals and Pai-Khoi; Murchison in European Russia and the Urals; Humboldt, Rose, and Ehrenberg in the Urals and the Altai Mountains; Helmersen, Ledebur, Chikhachev, and Shurovsky in the Altai; Hofmann in the gold-bearing regions of Sayan, Lake Baikal, and the Yenissei Basin; and Middendorf in Northern and Eastern Siberia. The Crimean War of the 50's again put a stop to the expeditions and the only works of importance published were those of Antipov and Meglitsky on the Urals; Meglitsky on the coast of Lake Baikal and the Stanovoy Range; and Dietmar on Kamchatka.

During the twenty years that followed, exploration work made great strides, owing mainly to the foundation of the Geographical Society and its Siberian branch, and to the annexation of the Amur district and the Island of Sakhalin to Russia. This period included the big Siberian expedition of Schwartz, Maak, and Schmidt to the Transbaikal region, along the Amur River and in the Ussuri district; Maak's study of the Vilyu Basin; the study of the Island of Sakhalin by Anosov, Lopatin and Schmidt; Kropotkin's expedition to Sayan, the Great Khingan Mountains, and from the Lena River to Chita; Chekanovsky in the Lower Tunguska region; Olenek on the Lena River; Chersky in the Baikal district and from Irkutsk to the Urals; Lopatin on the Vitim Plateau and in the Podkamennaya Tunguska Basin; Lopatin and Schmidt along the lower reaches of the Yenissei; Maidel in Yakutia; Abikh's work in the Caucasus; Semenov, Severtsov, Ivanov, Fedchenko, Mushketov, and Romanovsky in Turkestan; and Przhevalsky in the Ussuri region.

All these expeditions and research work in the nineteenth century greatly increased our knowledge of the geography and geology of Russia. This second period, like the first, was one of the large scale expeditions, but is distinguished by detailed local research in a number of districts of the extensive territory of the Russian state.

The third period begins with the inauguration of the Geological Committee in 1882. It is the period of planned geological surveys which had, to some extent, been begun earlier by the Mineralogical Society. During the first ten years of its existence

the Committee was only able to carry out surveys in European Russia, in the Kalmyk Steppes and the Urals, owing to its small staff (seven members). Other events worthy of mention during these years were Mushketov's expedition to Verny to study the earthquake of 1887; Bogdanovich's and Obruchev's explorations in the Transcaspian region; Fedorov in the North Urals; the expedition of Bunge and Toll to Verkhoyansk and the Novosibirsk Islands; Obruchev's researches in the Baikal district, along the Lena River and the Lena gold-bearing district; and Chersky's expedition to the Kolyma region, an expedition that was cut short by his death.

In 1892 the building of the long trans-Siberian railway led the Mines' Department to send several parties of young geologists, under the direction of the Geological Committee, to study the southern regions of Siberia. A geological survey of the Altai district was begun on the instigation of the Tsar's Cabinet. Between 1899 and 1913 the gold-bearing regions of Siberia were studied. The number of members of the Geological Committee was gradually increased, a fact which made it possible for the Committee to extend its geological survey in European Russia and begin survey work in the Caucasus, in Central Asia, and in several Siberian districts, and to organize expeditions to the Island of Sakhalin, the Aldan Mountains, and Maya. The Academy of Sciences equipped the Toll expedition to the Taimyr Peninsula and Bennet Island; the Baklund and Tolmachev expedition to Anabara and Khatanga; the Mines Department sent Bogdanovich to the Okhotsk region and to Kamchatka, and at the same time he visited the coast of the Chukotka Peninsula. Worthy of mention also are Baklund's investigations of the Northern Urals beyond the Arctic Circle; Sapozhnikov in the Altai, Saura, Jungari-Alatau, and Tian Shan; Ryabushinsky's Kamchatka expedition; Obruchev's work in the frontier regions of Jungaria and in the Altai Mountains; Pavlov in European Russia, and Levinson-Lessing in the Urals and the Caucasus.

The World War of 1914 compelled the Geological Committee to turn its main attention to the study of mineral deposits, and the Academy of Sciences to summarize our knowledge of mineral resources in the form of the publication by a special commission of a series of lists of mineral deposits and a number of geological papers.

In general, at the time of the October Revolution the territory of Russia had been very irregularly studied from geological and geographical standpoints; the parts that had been most closely studied lay in the European part of the country (excluding the north), and, to a lesser degree, the Urals, Caucasus, Central Asia, and the southern part of Siberia, while the northern part of Siberia was little known. Very few scientists were engaged on geological and geographical work.

After the October Revolution, the intervention and the civil war slowed down and to a considerable extent stopped this work, but subsequently the rapid development of exploration began. The demands made by construction and industrialization in a backward country required first and foremost the rapid discovery of mineral resources; and geological parties, the number of which grew year by year, were engaged mainly on the survey of mineral deposits. General geological surveys were carried out only incidentally, but planned geological survey ceased until the early 20's. Branches of the Geological Committee were opened in Tomsk and Vladivostok in 1919; they later became Trusts and then Administrative Boards such as were later opened in other provincial centres and republics to explore the mineral deposits and then to make the general geological survey of their districts. At the same time the Geological Committee began a survey of the whole territory; in 1931, the Committee became the Central Geological Research and Exploration Institute, and, in 1939, the All-Union Institute of Geology. The Oil Exploration Institute and, later, Geological Administrative Boards in several of the People's Commissariats were founded. As the number of specialists grew, the exploration began to cover larger

areas of the Soviet Union. The study of the Polar Regions was undertaken on a large scale by the Arctic Institute of the Chief Administration of the Northern Sea Route, while, in the Far East, the Kamchatka Company and Dalstroi (Far Eastern Construction Company) were working.

In 1929, the Academy of Sciences, after the number of its members had been doubled, undertook geological exploration work, although at first on a modest scale on account of its small number of institutes of mineralogy, geology, and petrography. When transferred to Moscow in 1935, the number of workers was increased and the work greatly extended, expeditions for special objects being sent to various parts of the Soviet Union. The Academy also organized branches which took part in exploration work in the Urals, in Vladivostok, and in a number of republics. The Academy organized conferences at the request of the Yakut, Buryat-Mongolian and Kazakh Republics to summarize the results of the exploration and to work out future tasks. The Academy held sessions in the Urals and in Siberia, conferences on various current problems in geology and geography, organized a special commission on quaternary deposits, on the Caspian and Pacific meteorites, and on perpetually frozen soil. The latter was converted into an institute.

The work done since the October Revolution consisted in expeditions to distant parts of the country for a rapid, preliminary survey of large areas, as well as expeditions for the detailed study of separate districts and mineral deposits; both types of expedition provided a wealth of material on the geology and geography of the territory occupied by the Union. The enumeration of the expeditions and their members would occupy a large number of pages; we shall therefore mention only the most important: a study has been made of the Kola Peninsula with the Khibin massif and the Monche tundra, the Pechora Basin, the Arctic Urals, the Taimyr Peninsula and the Severnaya Zemlya Archipelago, the Tungus and Kuznetsk Basins, the Altai Mountains, Western and Eastern Sayan Mountains, the Cisbaikal area, the Transbaikal area, the Anabar massif, the Aldan Plateau, the Varkhoyansk-Kolyma region with the formerly unknown Charsky Range, the Chukotka Peninsula, Kamchatka, Sakhalin, the Pamirs, and the Kara-Kum desert. There must also be mentioned the opening of the Northern Sea Route, Papanin's drift on the ice-floe from the North Pole to Greenland, the drift of the "Sedov", and the flights across the Arctic Ocean which provided so much new data concerning the hydrology of the ocean and the state of the ice-crust; a number of polar stations were also organized, as well as stations on the Fedchenko glacier and on Mount Elbrus, a limnological station on Lake Baikal, and stations for the study of eternally frozen soil at Vorkuta, Igarka, Yakutsk, and Anadyr.

The number of parties engaged on field work, prospecting, surveying, and other forms of exploration increased rapidly from year to year. The number of these parties, the areas that they covered, and the funds expended on them, soon by far exceeded similar figures in any of the capitalist countries, so that on the occasion of the twenty-fifth anniversary of the Soviet Union we had every reason to state that the successes of geologists in that period were many times greater than those achieved during the whole preceding 200 years from the time of the first surveys of Russia under Peter I.

The achievements made in the geological study of the Soviet Union during the first twenty years of its existence were made public at the Seventeenth International Congress of Geologists, which gathered in Moscow in the summer of 1937, in the many papers read by Soviet geologists and in the exhibitions arranged in Moscow and in the Urals both during and after the Congress.

It must be remembered, finally, that Germany's treacherous attack in 1941 compelled the Soviet to make great changes in its plan for geological and geographical work, and to devote attention and the efforts of all workers to the study, prospecting, and survey of the deposits of minerals essential for defence.

(1) Lt.-Col. John Graves Simcoe, first Lieutenant-Governor of Upper Canada. Society in the town of York was moulded upon the English Georgian Court.
Courtesy Toronto Art Gallery

GEOGRAPHICAL FACTORS AND LAND USE IN TORONTO

by **NADINE A. H. DEACON****

I. *TOPOGRAPHIC AND HISTORIC CONTROLS*

A. *Land Surface and Geologic Origins*

WHEN Governor Simcoe established himself and his retinue on its shore in 1793, York (as he renamed Toronto), presented quite a different appearance from that of to-day. A dip to the water's edge formed a grassy bank from twelve to twenty feet high, that steepened from the present Exhibition Grounds to the Humber River. Behind the bank stood a forest of oak and pine upon a sloping muddy plain traversed by several marshy creeks. These, as well as the two main rivers, the Humber and Don, flowed from northwest to southeast, following the general slope of the land. One of these creeks was named Garrison Creek because it had a fairly deep bed through the west portion of the city plain and high banks at its mouth which provided excellent facilities for the fort and soldiers' barracks.

The first streets of York were laid out just west of the mouth of the Don River —a protected site well to the east of the entrance to the harbour, although to the northwest lay the flat swampy grounds through which flowed the Taddle Creek. This creek originally found its way across the present university grounds, and parts of its former course can still be traced on the campus (see figure 2).

About three miles back from the shore rose the wooded heights of the old Iroquois shoreline. East of the Don River, between the sandy peninsula and the shore, several small streams emptied their sediments into a marshy area also filled with silts from the Don River. This marsh was cut off from the harbour on its west side by a sandy strip used as an approach to the peninsula by the early inhabitants. The marshy area early became known as Ashbridge's Bay.

These surface features (topography) at Toronto were the result of the Pleistocene glaciation. The last retreat of the ice sheet from southern Ontario occurred about 25,000 years ago, leaving behind it a pile of rock and silt debris known as glacial till, which lay over the Toronto area from 40 to 400 feet deep. Bed-rock, therefore, appears only along the lower Humber River south of Weston, and in the quarry of the Don Valley Brick Works.

The ponding of water between heights of land and the retreating ice sheet produced forerunners of the Great Lakes, that of Lake Ontario being known as Lake Iroquois (figure 1). Geologists* recognized

*A. P. Coleman, *The Pleistocene of the Toronto Region*, Ontario Dept. of Mines, Report No. 41

**Where not otherwise credited, photos by author.

the old shoreline of this lake in Toronto from facts apparent in the land surface. The sudden rise of land south of St. Clair Avenue, and the continuation of this hill north of Davenport Road, rising from 425 feet to 450 feet throughout its length, was traced around the Humber and Don Rivers where it formed two large flat-bottomed bays, silt-filled to the 425-foot level. It is possible that there were pre-glacial channels of the Humber and Don before the silts of Lake Iroquois were deposited. The sloping plain south of the 425-foot contour consists of Iroquois clays forming the City Plain which in the time of the early settlers of York became so sticky during wet weather that the town was known everywhere as "Muddy York".

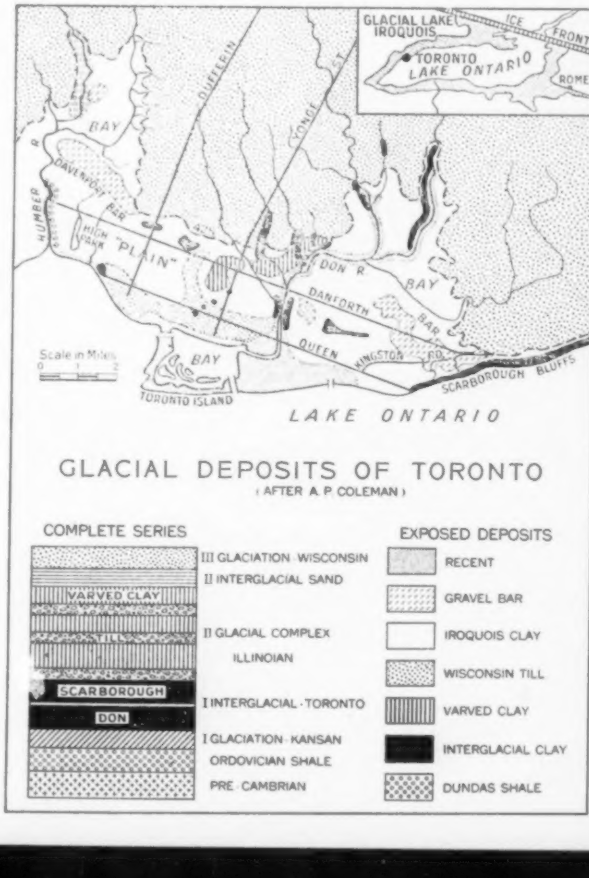
It is interesting to note that the courses of the Humber and Don parallel each other*. Each also receives a large tributary from the east (Black Creek and the Little Don respectively, see picture 2), and is deflected to the west by a sandy hook. Persistent erosion by currents in Lake Iroquois had cut back the glacial till in Scarborough to form the famous Bluffs (picture 3), and had deposited this debris, forming a sand-bar in the Don Bay. During the same period, erosion of the shoreline above Davenport Road had furnished enough sediment in the Humber Bay to form another sandy hook (figure 1).

The finely dotted region in figure 1 represents the recent sand deposits formed by long-shore currents in Lake Ontario which were laid down in the same manner as the sand bars of Lake Iroquois times. The present Scarborough Bluffs, rising higher due to reduction in lake-level when the ice sheet retreated (Lake Iroquois 425 feet above sea-level, and Lake Ontario 247 feet above sea-level), were attacked more vigorously by water erosion, producing sufficient sediment to form the sandy hook or peninsula extending westward from Woodbine Avenue. After a storm in 1852 which tore out an entrance (the present Eastern Gap) in the peninsula, it came to be called Toronto Island (pictures 4, 5, 6)—now a summer resort area. The building process by sedimentation has continued extending the Island westward. The lighthouse first built in 1808 (picture 8) has appeared to recede inland as a result of this action. Another on-shore sand bar has developed near the mouth of the Humber producing the present Grenadier Pond.

B. *Early York and Subsequent Changes*

In 1791, Augustus Jones, Deputy Provincial Surveyor, surveyed the north shore of Lake Ontario from the Humber to the Trent Rivers, establishing parallel townships. Queen Street was his base line in the Toronto section, north of which land was reserved for park lots 660 feet wide; hence the name of Lot Street for Queen. In 1793, Surveyor Aitkens, by order of Gov. Simcoe, drew up a street plan for the town of York. This plan was the traditional and unimaginative European gridiron which came only too soon into conflict with the trend of the Toronto land surface. Palace, George, Duchess, and Ontario Streets bounded the parallelogram, commemorating by their names the ruling Hanoverian House in

Figure 1



*Griffith Taylor, "Topographic Control in the Toronto Region", *Canadian Journal of Education and Political Science* November, 1936

(2) Part of Toronto ravine system — Donalda Farm. Little Don River forms ox-bow.

(3) Left:—Part of Scarborough Cliffs known as "The Dutch Church"

England. For military communication, Yonge Street was early surveyed and cleared north to Holland Landing, and Lot Street continued through the west to Niagara as the Dundas Highway and Kingston as the Kingston Road.

The town soon outgrew the Aitken plan, and a second network of streets was laid out in 1817. The barrier of swampy land west of New (Jarvis) Street created the appearance of an old and a new town (figure 2). Street names in the second projection of streets indicated their use in the little community of York. Hospital (Richmond) Street led to the hospital, Newgate (Adelaide) Street was the site of the gaol, Market (Wellington) led to the first market place, Palace (Front) Street was a path south of the Parliament Buildings. Figure 2 likewise shows the last remnants of early paths cutting across the street pattern. Russell Creek

Toronto Island:

(4) Above:—Centre Island parks and lagoons

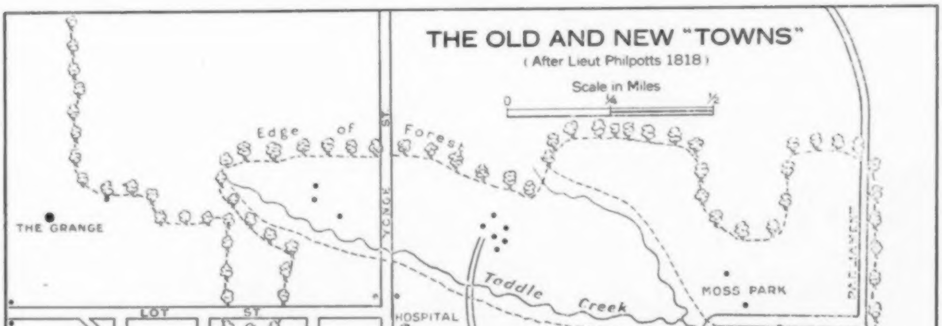
(5) Top right:—Royal Canadian Yacht Club lagoon and sail-boats

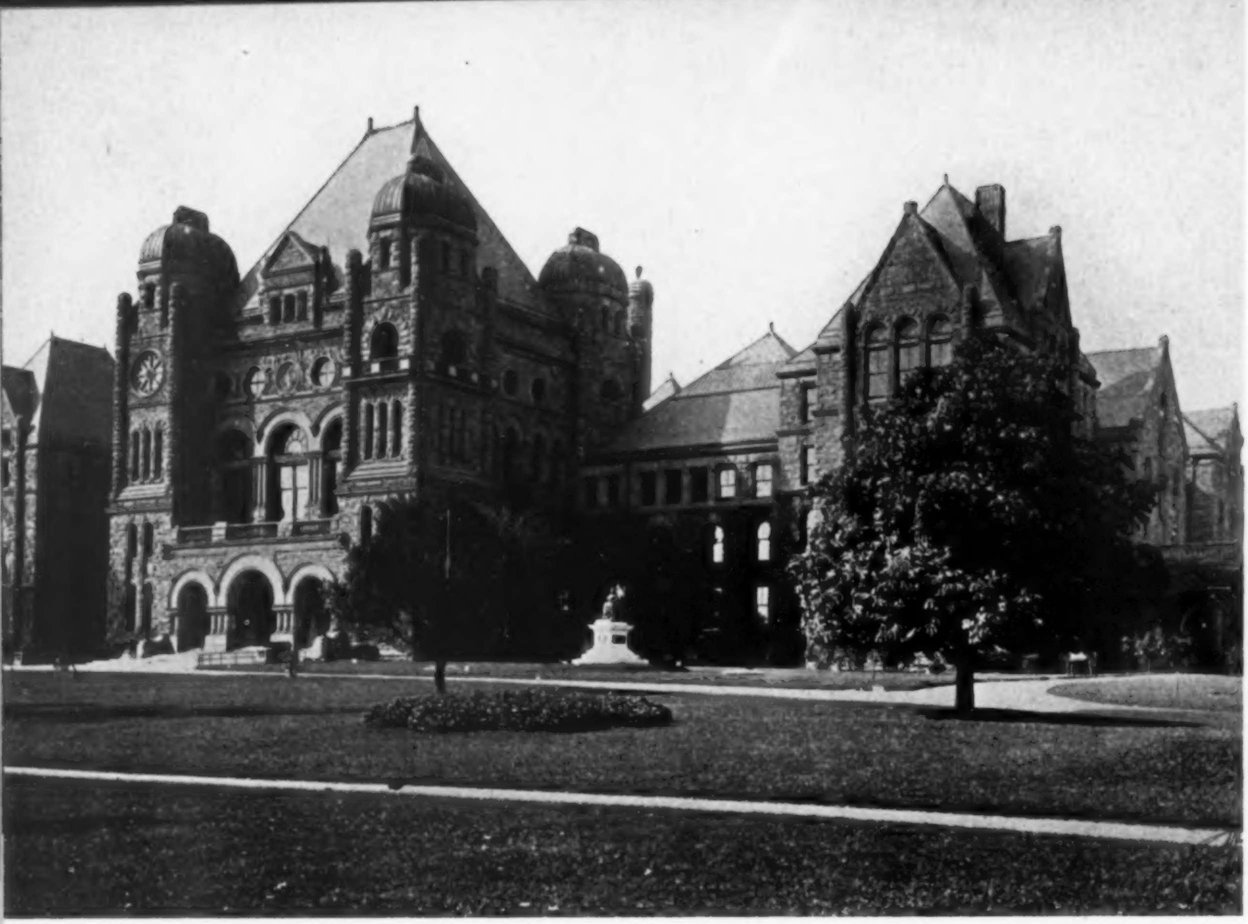
(6) Right:—Typical summer cottage on beach and board walk

became the next limiting factor in the growth of the town.

The development of York in the nineteenth century showed two distinct controls. Up to the 1850's the town became a slowly growing city (incorporated as Toronto in 1834), limited chiefly by geographic controls. Then rapid expansion came at the turn of the century with the development of the railways and harbour (and subsequent industrialization) which made Toronto a focal point in Ontario, changing its character from a purely governmental seat with commercial connections to a leading industrial city of Canada. As the capital of the rich Province of Ontario, she attracted to herself the best in the cultural arts.

Figure 2





(7) Present Parliament Buildings. Note flamboyant Victorian style of architecture which characterized the greatest period of building in Toronto between 1870 and 1920. Courtesy Toronto Art Gallery

Old Parliament Buildings of Toronto. Built 1826 and rebuilt in 1832 after fire. This is the second site; the first wooden buildings were built in 1798 at the foot of Berkeley Street in the old town. Courtesy Toronto Art Gallery

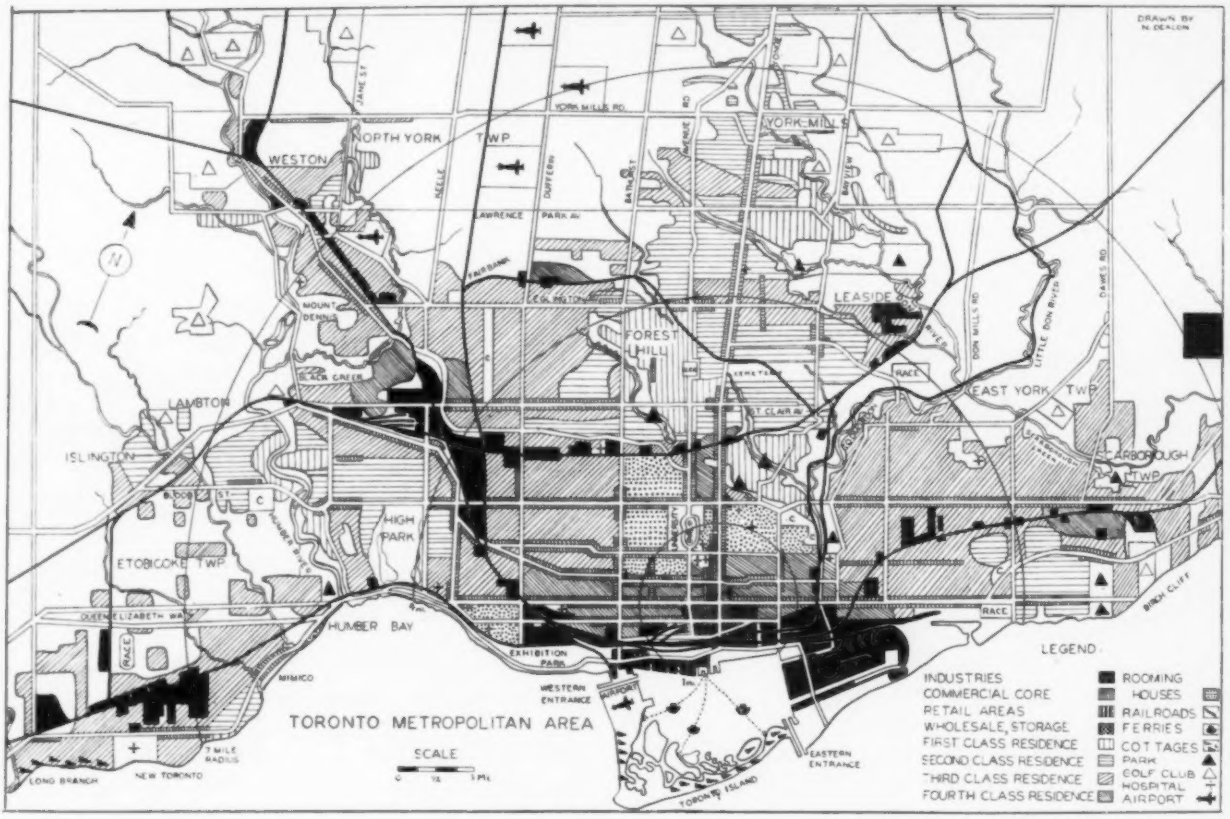


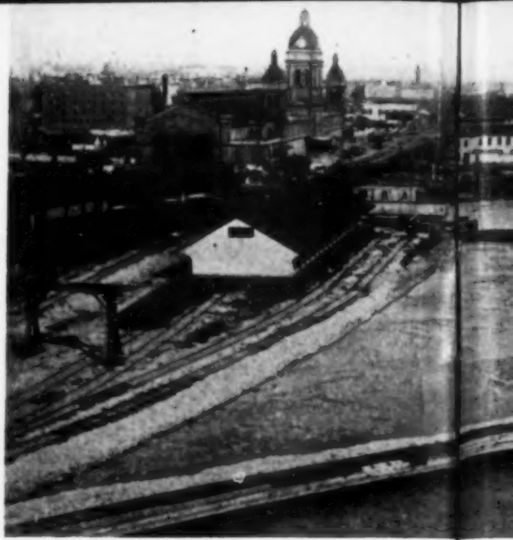
Figure 5

Over the period of a century and a half, Toronto has displayed an ever-growing tendency, hastened by a period of annexation from 1883 to 1914, to extend northwestward. Since 1920, the western barrier of the Humber has been overcome, to a great extent, by modern viaducts developing a new trend of growth southwestward. Expansion has also taken place southeastward, aided by modern bridging of the Don ravines, but the profile of this river, more juvenile than that of the Humber (steeper ravines) seems to have halted growth northeastward to a great degree. Yonge Street, as a through road to Georgian Bay, has been an artificial stimulant to northward city building, for natural features limited this expansion by successive ravines cutting transversely across its path. Figure 5 shows that the Humber-Don barriers are still the dominant factors controlling direction of growth of the city.

The waterfront of Toronto has materially changed its original appearance over the last hundred years by two extensions in area. Ashbridge's Bay in the early nineteenth century was used for the city's refuse, and, by the time of City Incorporation (1834) had become badly polluted. Private ownership of the

(8) Old lighthouse built on west tip of island in 1808 —now inland.

(9) Central harbour terminals — harbour front from Bathurst Street to Yonge Street
Airmaps Limited, Toronto, photo

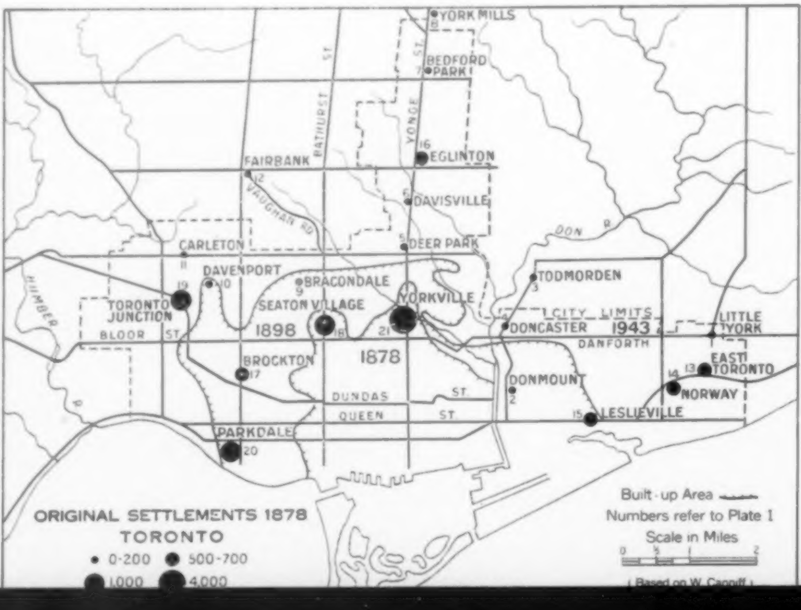


(10) Toronto Harbour, 1884. Looking east to the Don, sh
the foot of John St

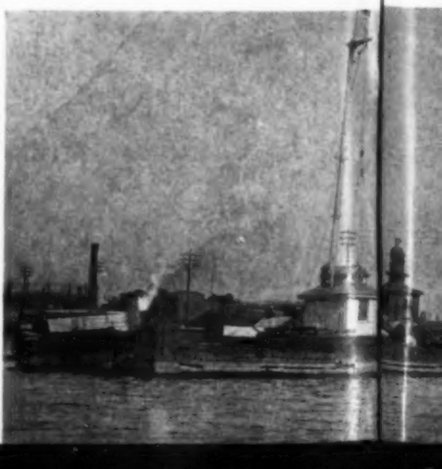
waterfront wharves had led to decay and deterioration to such an extent that the City Council took steps to build a pleasure promenade where the filled-in slips were then located at the foot of Front Street. The Esplanade, completed in 1865, added 100 feet of land, but the building of the first railway lines at this time converted the pleasure promenade into a railway right-of-way (picture 10).

It was not long before the Eastern Gap, filling with shifting sands, had to be canalized, and the Western Gap, likewise afflicted, replaced by a new cut south of the old channel, which left the lighthouse high on land on the present Exhibition Grounds (picture 11). Overcrowding and later decay of dock facilities led to the creation of the modern Harbour Commission, and the last series of reclamations produced the waterfront of to-day. The railways were elevated by viaducts over the crossings at Sherbourne, Jarvis, Yonge, Bay, York, Spadina, and Bathurst Streets, and a new Union Station was completed by 1930. The former esplanade shoreline was extended to Fleet Street, and the Queen's Quay (picture 9). Ashbridge's Bay was filled in to create the modern eastern industrial area with a turning basin in addition to the old drainage channel of the Don, Keatings Cut. The

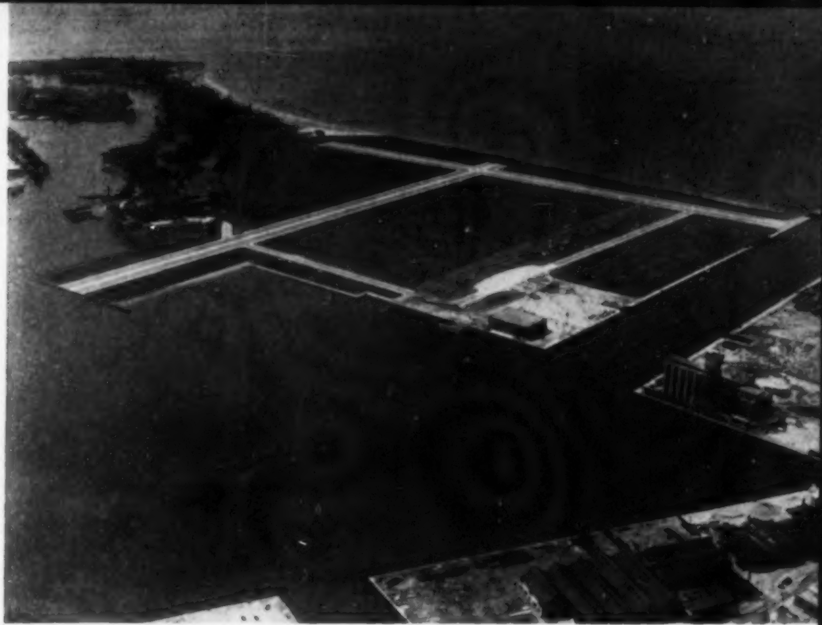
Figure 3



(11) Red lighthouse (1861) and old
Courte



to the Don, showing the esplanade and wharves from
oot of John Street.
Courtesy Toronto Art Gallery



(12) Island airport (used by R.N.A.F.) and new Western Gap
Airmaps Limited, Toronto, photo

land from the Humber River to the Exhibition Grounds was extended by parks and the Lake Shore Drive. During the last decade the Island Airport was created, extending the tip of the Island (picture 12).

II. CHARACTER OF CITY EXPANSION AND LAND USES

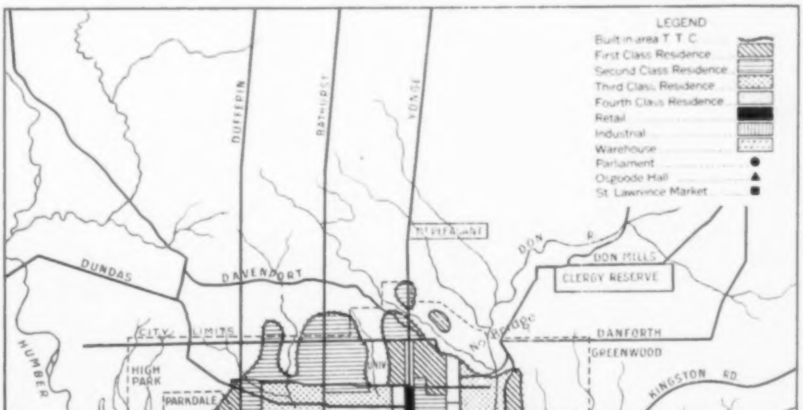
A. Three Phases of Expansion

The growth of city profiles is usually characterized by typical phases of expansion:* (*a*) growth from a centre of origin in widening concentric zones representing relative uses of the city land during development; (*b*) increase in area of corporate city by annexation; and (*c*) lateral expansion of the built-up zone and vertical growth of the centre of the city. These stages of change can be identified in Toronto, subject to variation by dominant geographic controls. Location of the site on the edge of the lake flattened the tendency of normal circular growth to a semi-circular east-north-west expansion. These zones of arc-like development, moreover, became distorted progressively as the barriers of the Humber and Don ravines limited direction.

*Thomas Sharp, *Town and Countryside*, Oxford University Press, 1932

(1861) nd old Western Gap (1914)
Courtesy Toronto Harbour Commission

Figure 4

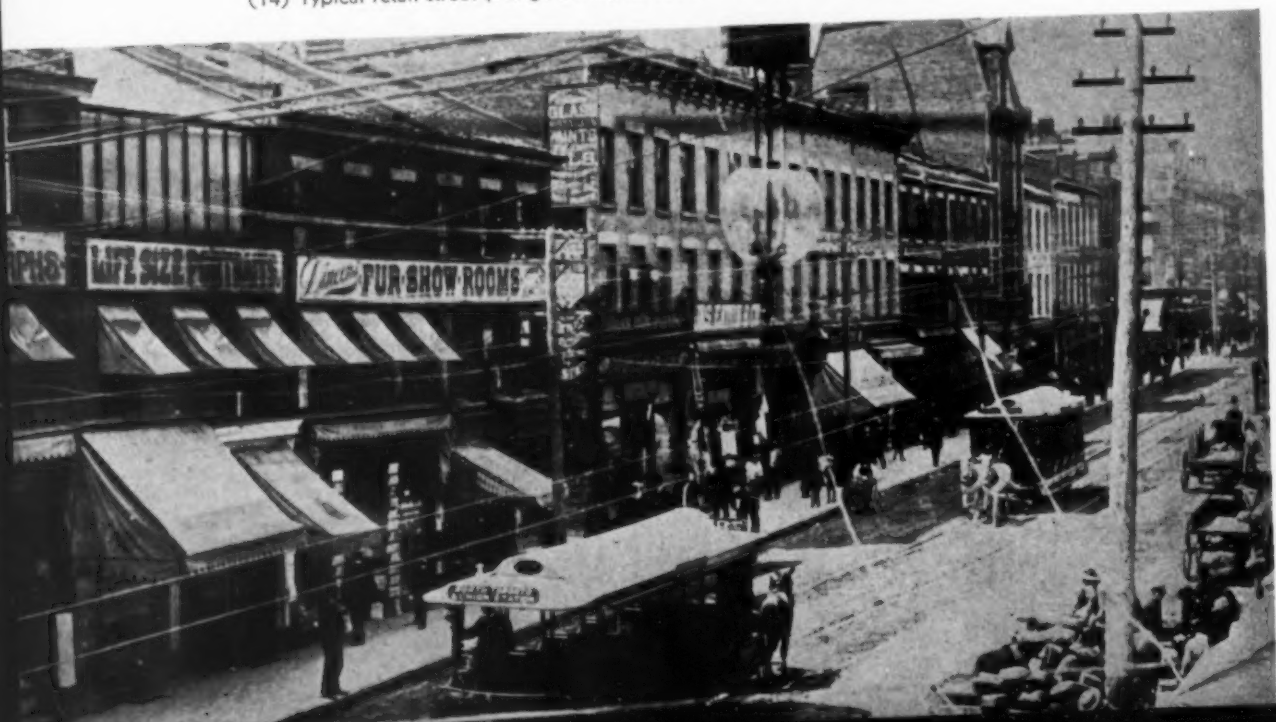


(13) Commercial and warehouse district of Toronto in 1870

Courtesy Toronto Art Gallery

(14) Typical retail street (Yonge Street) in 1890. Note type of transportation.

Courtesy Toronto Art Gallery



(15) Commercial core of Toronto in 1930. Note vertical expansion. Courtesy Toronto Art Gallery—Photo by Brigdens Limited

Figure 3 reproduces the original settlements about the corporate city area. The isopleth (line showing limit of built-up streets) of 1878 represents the first broad phase of expansion, in which central areas are growing as rapidly as peripheral areas. Notice that not until after 1885 did the city expand beyond the confining Iroquois shoreline, nor make much advance across the Humber-Don barriers.

In 1883, Toronto began a period of annexations to the city, which greatly extended the corporate area (see second isopleth, 1898, in figure 3), until the last annexation in 1914, when the present city limits were arrived at, as in Figure 3. This was the second phase of expansion, characterized by areal increase of the city by annexation, which took in all the outlying nuclei of settlement.

The land uses in 1885 reveal the beginnings of central decay (figure 4). The central core, which is the commercial heart of the city, has expanded westward from the old business section on Jarvis Street (1820's), taking over the dilapidated wooden buildings of the old town, and producing a transitional zone of decayed residential standards (picture 13). York and Elizabeth Streets contained the worst depressed area of the city. This region has persisted down to the present time. Yonge Street was already a leading retail street of the time (picture 14). Curiously enough, the seat of government had at that time been built in close proximity to the commercial core, and did not advance northward away from the commercial railway

Second Class Residential:

(16) Typical new dwellings, near Forest Hill

(17) Favoured ravine site. [illegible]t of Don River

section until a decade later. Upper Canada College and Government House were located nearby on Simcoe Street.

The railway areas on the esplanade determined the sites of industrial development, and about these was located the warehouse and storage region. Jarvis Street, from Bloor to Wilton, was the centre of the fashionable homes of the 80's. Large Victorian brick dwellings were set in spacious lawns. Another fine area surrounded the university, north of College Street. Rosedale and Parkdale were outlying suburbs with large homes. These land uses or functions (residential, retail, commercial, industrial, and governmental) kept their identity in an expanding city, but growing in complexity to the present day.

B. Land Uses in 1941

The third phase of development occurred in Toronto after the last Great War when skyscraper office buildings began to dot the downtown area because of high land values and lack of space for central expansion (picture 15). Lateral expansion in area continued producing large satellite towns in the main directions of growth. This phase marked Toronto as a twentieth-century metropolitan complex.*

*Lewis Mumford, *The Culture of Cities*, Harcourt, Brace & Co., New York, 1938

(18) Fourth Class Residential: — Example of terracing, brick construction

Courtesy Toronto Art Gallery —Photo by C. F. Comfort

First Class Residential:
(19) Forest Hill Village (20) Estate home in Bayview district

Figure 5 pictures the land uses of Toronto in 1941, as well as the land uses of the satellite communities lying about the periphery of the city, revealing the *mélange* of present residential areas cut across by railway development and encroachment of industrial regions.

The Fourth Class Residential areas present houses of a deteriorated and overcrowded condition, housing more families per unit-dwelling than recommended by the requirements of health, and for which the ordinary municipal facilities are in disrepair (picture 18). This class, encroached upon by the commercial and industrial districts of the city, is the centre of settlement for people of foreign extraction and for the unskilled labouring class.

Third Class Residential areas represent the vast number of artisans' dwellings—on the whole, a monotonous procession of row upon row of similar brick houses. This is a transitional region between fourth and second class residential areas, as well as a suburban region located near new industrial development (pictures 21, 22).

The Second Class Residential area is characterized by neat houses of differing designs surrounded by well-kept lawns (picture 16). The houses of this group cost upwards of $12,000 to build, most of them being owned by the residents belonging to the professional, business, and small *entrepreneur* class. Outlying city areas and favourable suburban sites are the usual locations, but older first-class sites fall into this classification as well (picture 17).

The First Class Residential areas consist of large homes and gardens located on ravine sites and hill tops both in the city and in outlying suburbs; e.g., Forest Hill Village and the estates of Bayview (pictures 19, 20).

The Rooming-House area occupies two sections of the city. The eastern division is near the poor sections of the Don River; the western division is located about the University and Parliament Buildings. The

Third Class Residential:
(21) East of the Don River. Note row housing of brick. Off Coxwell (22) Newer suburban development. Leaside

Canada Life Building of modern times contrasts with Osgoode Hall built in the 1830's.
Courtesy Toronto Art Gallery—Photo by Pringle & Booth

tourist centre along the Lake Shore Drive caters to Exhibition visitors and tourists in the summer season. Areas of Apartment-House Development are regulated by the residential qualifications of the districts in which they are constructed (pictures 27, 23, 25).

In 1937, according to a report of the *Toronto Star*, the city had a total of 120,419 dwellings, of which 85 per cent were of brick construction, 4.9 per cent of wood, 9 per cent of stucco, 6 per cent of stone, and 5 per cent of cement bricks. It is natural that bricks should play such a great part in the building of houses in the Toronto area, which has several brick companies making red and yellow burning

(23) Modern apartment house on modern wide avenue, St. Clair, 1938. Note type of transportation.
Courtesy Toronto Art Gallery

(24) Front Street is well inland to-day. Modern Royal York, Post Office and Union Station
Courtesy Toronto Art Gallery—Photo by Pringle & Booth

bricks from the interglacial clays. In 1937 the number of home owners in Toronto exceeded the total of home owners in Montreal, Winnipeg, and Hamilton combined. Of the various types of dwellings, 18 per cent of the total were apartments and flats, 7 per cent row or terraces, 30.5 per cent single houses, and 44.5 per cent semi-detached houses.

The boundaries between the broad functions of Toronto, which are mapped in figure 5, are only approximate divisions. To

Second Class Residential: (25) Modern apartments, Leaside

Courtesy Toronto Art Gallery —Photo by Max Scheerle

either side, transitional areas exist in a constant state of flux, due to the phases of city expansion from the original centre.

The commercial core is the central meeting point of the chief arteries throughout the city. All the main business offices and large retail and department stores are located here, as well as insurance, finance, and banking houses. The City Hall is in the heart of the region at the head of Bay Street financial centre, akin to New York's Wall Street (picture 26). Yonge Street is the crux of the retail trade, while King, Adelaide, Richmond, and Victoria Streets contain most of the main business offices. All the large theatres and music halls are located here, including the main hotels (picture 24).

The retail areas of the city are located along the main arteries of travel. New suburban nuclei also attract outpost retail development (pictures 28, 29). The retailing of goods falls into two main sections; one consists of merchant and grocery shops of every variety, which appear along the main streets (picture 30) and in suburban areas, and the other makes up a group of decadent, small and dark stores, including hardware, clothing, Italian fruit and vegetable, Chinese curio, Jewish dry-goods, pawn shops, drug, and barber stores. This group occurs near the central core of the city along the earliest streets, such as King, Queen, Dundas, and West College Streets, and does business with third and fourth class residential areas.

Near the railway terminals and in the central harbour area, south of the commercial core, occur the storage and warehouse regions of the city. Extensive docking space provided by harbour development and good co-ordination of railways and highways facilitated development. This area, which centres about Wellington, Front and Esplanade Streets, includes the main wholesale firms of the city.

The industrial sites of the city have been developed near railway, harbour, and highway facilities. The branches of the Canadian National and Pacific systems cut right across the city profile in general, following the Don and Humber Valleys northward. No matter what direction the

(26) Bay Street at night. Toronto's Wall Street
Courtesy Toronto Art Gallery—Photo by Molyneux

rails take, industrial sites and depressed housing inevitably follow. The new industrial outposts in satellite communities all hug the railways; e.g., Long Branch, Mimico, New Toronto, Weston, Leaside and the Danforth. The new harbour area is the main location of heavy industry in Toronto.

The parks of downtown Toronto follow the courses of former creeks on the Iroquois City Plain, with many interruptions due to unfortunate attempts made during early settlement to build streets across their courses. However, north of the Iroquois shoreline, most of the ravines are left in their natural wooded state. The lower Don Valley has been disfigured by railway right-of-ways, which the Humber fortunately escaped. High Park was preserved through the gift of a far-sighted citizen to the city. The instances of inattention by the city to the beauty of the ravines no doubt has arisen because of the tremendous difficulties encountered in bridging them to allow for city expansion. Early wooden bridging was replaced by iron bridging in the 1880's (picture 31), but not until the 1920's were the modern viaducts projected, which eliminated the steep road grades (picture 34).

Toronto is still, however, a city of beautiful ravines (picture 32) and parklands (picture 33), excelled by few Canadian cities. Within Queen's Park, one of the city's major parks, are the Provincial Parliament Buildings (picture 7). Just to the west are the spacious and well kept grounds of the University of Toronto, a leading educational centre of Canada. About a mile and a half to the north, at the head of Avenue Road, lie the attractive grounds of Upper Canada College, and in Rosedale, commanding an impressive site above the Don River, is Government House, now used as a hospital for soldiers. The sky-line of Toronto (picture 35) highlights many of the prominent buildings and embodies the spirit of this complex metropolis.

Top to bottom:—

(27) Apartment blocks, Eglinton Avenue

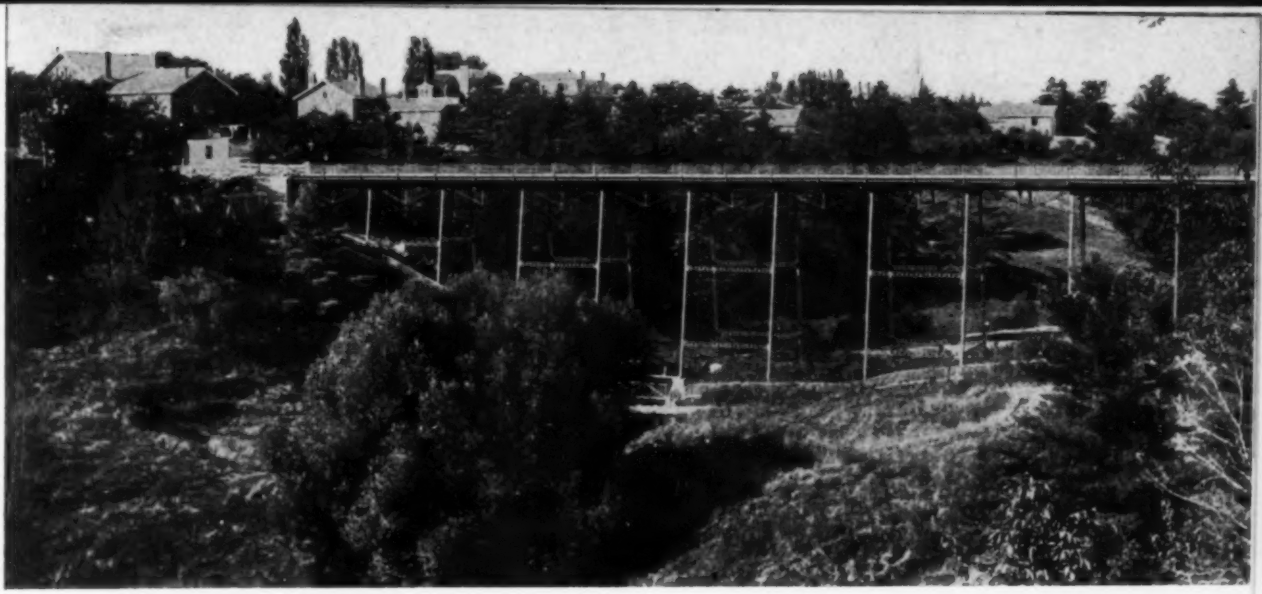
(28) Eglinton Avenue West, Bathurst crossing

(29) Outlying retail area of Forest Hill Village

(30) Kingston Road near city limits

(35) Double-page spread, pages 98 and 99:— Present waterfront of Toronto, showing elevated railways and round-house.

Courtesy Toronto Harbour Commission



(31) Huntley Street Bridge to-day. Example of late nineteenth century bridging of Toronto ravines. Courtesy Toronto Art Gallery

(32) Ravines enhance Toronto's beauty by natural parkland.

(33) Balmy Beach Park, East Toronto

(34) York Mills Viaduct. Modern bridging of Don ravine barrier facilitating north-bound traffic out of Toronto, eliminating necessity for the long Yonge Street grade. Courtesy Toronto Art Gallery—Photo by Brigdens Limited

TEN THOUSAND SEA CADETS AT NAVY LEAGUE CAMPS THIS SUMMER

by **R. C. STEVENSON**

BOYS from each of the 88 Royal Canadian Sea Cadet Corps, practically all of which are sponsored by the Navy League of Canada, will be attending camps in various parts of the Dominion this summer. Last year approximately seven thousand Sea Cadets and Officers spent two weeks in training at one or another of the twelve camps, but this year it is estimated that at least ten thousand of the total enrolment of fourteen thousand will attend.

While an attendance of 10,000 represents a substantial increase over the 1943 figure, the difference is even more marked when this is compared with the 1942 record. In that year there were probably only four or five Sea Cadet camps in existence and they were operated by the Navy League, whose officials assumed all the responsibility of not only operating the camps but of providing the training staff as well. The year 1943 marked a change of policy, for at that time the Department of Naval Services undertook to supply all the food and the necessary staff to operate the camps, including a commanding officer and a sufficient number of naval officers, petty officers and instructors to supervise the training. As many as possible of the officers of each Cadet Corps attended the two-week camping period with their boys, as it gave them a splendid opportunity to get to know the Cadets better. It is expected that with last year's experience as a guide, the camps will be even more efficiently operated and will prove of greater benefit to the Sea Cadets both in their training and their physical well-being. The Navy League is responsible for furnishing the camp-sites, and many improvements have been made in the accommodation at some of the camps which will greatly facilitate the arrangements and add to the comfort of the boys and officers.

Camp Programme

The time-table and training programme vary in accordance with the locality and general conditions at the camps, but usually the first item is at 6.30 a.m., when the bugle call "Lash and Stow" rings out. In fifteen minutes the boys have formed up outside the barracks attired in bathing trunks and equipped with towel and soap ready for the morning dip; most of them appear to enjoy the refreshing plunge. Physical "jerks" follow, and much fun is derived from various games and warming-up exercises.

Breakfast is at 7.40. The diet is planned by one of the world's foremost medical scientists, Surgeon-Capt. C. H. Best, of Toronto (co-discoverer with the late Sir Frederick Banting of insulin as a cure for diabetes), and is specially designed for growing boys rather than adult sailors. The boys show their appreciation—the food scientifically selected and prepared vanishes rapidly.

After breakfast, a brief period is allowed for cleaning barracks, and at 8.45 "General Assembly" is sounded and the divisions form up on the quarter-deck. After prayers, colours are hoisted, as is customary in the Navy with Divisions, a bugler sounding "General Salute". Then the instruction periods begin. There are two class periods in the morning and two in the afternoon, each followed by a supervised swim. Last year, of the 125 boys from one corps more than 100 passed their swimming tests, which was a remarkably good record.

In the class period, the Cadets are instructed in cutter pulling, rigging and

sailing the boats, soundings, heaving line, unarmed combat, rope climbing, sea terms and seamanship generally. Each division has at least one cruise on a motor yacht on which practical knowledge of many phases of seamanship is gained by the boys in a way impossible ashore or at home in city training quarters.

Evening quarters come at 5 p.m. and supper immediately after. The Cadets are then free to entertain themselves according to their bent; varied sports and sing-songs are popular. Colours are lowered at sunset, and at 10 o'clock comes "Lights Out", to be followed by "Pipe Down" at 10.15. The programme is much the same at all the camps with slight variations only to meet local conditions.

Twelve Camps

Every one of the nine provinces of Canada will be represented by Sea Cadets in the twelve camps which will be in operation this summer. These camps are located from coast to coast, from Camp Buchan on Northumberland Strait (about 31 miles east of Charlottetown) in Prince Edward Island, which will be used by Sea Cadets of that province, to Whitycliffe Point on the Pacific Ocean, a few miles outside Vancouver, where the Sea Cadets from British Columbia will camp.

The Sea Cadets from northern and southern Alberta will attend a camp situated on Chestermere Lake, 14 miles east of Calgary, one of the oldest and best-equipped camp-sites owned by the Navy League. There are a number of buildings here, including a boathouse built by the Rotary Club which shelters three sail boats: the *Rotary*, *Kiwanis* and *Gleaner*, one motor-boat, four cutters and two smaller craft. In addition there is a splendid dock presented to the camp by the Gyro Club.

Shepley Island, only six miles from Saskatoon, will provide camping facilities for the Sea Cadets of northern and southern Saskatchewan. This camp-site was used for the first time last year, and many improvements in the way of new buildings and additional equipment have been made this spring.

Manitoba Sea Cadets have usually camped on Lake Winnipeg, but this summer they will go to one of the Ontario Navy League camp-sites, namely, Lake Eva, near Kawene, approximately 125 miles west of Port Arthur. This camp was built in 1926 by an enterprising American who chose beautiful Lake Eva as a site for a camp to which boys of wealthy families might be attracted for summer vacations. There are over twenty buildings on the property, and it is well-equipped with a boathouse and numerous boats of varying sizes.

The Province of Ontario has provided the greatest number of Sea Cadets, and so it is only natural that there should be more camps situated within its boundaries than in the other provinces. In addition to Lake Eva, mentioned above, it has five other camps. "The Queen Elizabeth" is situated on Beausoleil Island in Georgian Bay, approximately twelve miles from Midland, while the "Princess Alice" Camp is about the same distance from Midland on Minnicog Island. The latter was honoured by a visit last summer from Princess Alice, who flew in a seaplane from Ottawa to attend the official opening of the camp. Both these camps are located in beautiful country and are fully equipped with buildings, etc., to take care of a large number of boys.

Another camp is at Kitchigami, five miles south of Goderich, while the most easterly camp in Ontario is on Rotary Island in the St. Lawrence River at Gananoque. This camp provides a splendid example of the interest service clubs have taken in the Sea Cadet organization, for the Rotary Club of Gananoque has agreed to allow their island to be used as a camp for Sea Cadets for the duration.

Above:—Sailing instruction period

Top left:—The *Oriole*, training ship for Sea Cadets, in a good breeze on Lake Ontario

Left:—Spinning a yarn

Right:—Physical exercise by way of sports

Below:—Slinging hammocks in Navy style

Bottom right:—"Lights Out"—tired after a happy day

Above:—"Cookhouse"—the most welcome bugle call

Top right:—Morning prayers at the "Bridge" of the ship (camp)

Above:—"Liberty Boat"—Sea Cadets "going ashore" (on leave)

Left:—Morning scrub at wash-tables

Bottom left:—Mess deck (dining-room to landlubbers)

Below:—Relaxation

Indian Bones Discovered

Historical interest was given to the Rotary Island camp when some Sea Cadets, while clearing the ground, uncovered a number of bones. Medical authorities identified them as those of Indians, two females, one male and one infant. This bears out the theory put forward from time to time that Indians inhabited this part of the St. Lawrence about 200 years ago, for the bones were declared, by the authorities who examined them, to have been buried in the ground about that length of time.

When the Minister of National Defence for Naval Services, Hon. Angus L. Macdonald, and Vice-Admiral Percy Nelles, then Chief of the Naval Staff, inspected this island camp last summer, they expressed themselves as being thoroughly pleased with the manner in which the training programme was being carried through.

The camp on Crow Island, in the St. Lawrence River about one-third of a mile from the City of Trois-Rivieres, will provide facilities for the Sea Cadets from Montreal, Trois-Rivieres and Quebec City. The great majority of boys from the two latter cities are French-Canadian, and, while they are in camp, the French language will predominate.

The New Brunswick Sea Cadets will have a new camp this summer, situated about 28 miles from Saint John at Oak Point on the Saint John River, and here the boys from Fredericton, Saint John and Moncton will spend two weeks.

Provision is being made to accommodate the Nova Scotia Sea Cadet Corps at H.M.C.S. "Cornwallis" near Digby. As this training depot is known as "the largest naval training establishment in the British Empire", the boys will undoubtedly get quite a thrill from the activities there. Because of the necessity for secrecy, there will be some things they will not be allowed to see, but there will undoubtedly be enough open to their view to arouse great enthusiasm.

The two weeks to be spent in camps by the 10,000 Royal Canadian Sea Cadets this summer will not only give them a splendid training in nautical subjects, but will improve their physique to a remarkable degree. While it is not compulsory for a member of a Sea Cadet Corps to join the Navy or the Merchant Navy on leaving the Corps, it is the hope of the officers of the Naval Services and the officials of the Navy League that the boys will be so happy in the nautical atmosphere of the sea services that they will desire to do so.

There are more than six thousand men who have graduated from the Sea Cadet Corps, who are serving in the armed forces, including the Merchant Navy, and many of them have proved the benefit of the training which they received—a number having won recognition for gallantry and good seamanship.

To cite one example: a former Sea Cadet, Lieut. Benjamin Russell, R.C.N.R., has been commended by both the Canadian and United States Governments for the manner in which the ship which he commanded, the "Guysborough", saved a United States Navy sub-chaser and her crew of 20 from a gale-swept North Atlantic. He received his early training in the "Nelson" Corps of Halifax.

The Navy labelled it "one of the most dramatic sea rescue operations of the war" and named Lieutenant Russell as "largely responsible for it". A veteran of 13 years sea experience with the Royal and Royal Canadian Navies and the Canadian Pacific Steamships, he claimed the sea, at the time of the rescue, was "one of the roughest" he had ever sailed.

At the time Lieutenant Russell was attached to the "Nelson" it was possible to make arrangements whereby a Sea Cadet could take an apprentice course with the Canadian Pacific Steamship Lines. This was done in his case, and he has followed the sea, with success, ever since.

EDITOR'S NOTE-BOOK

J. Lewis Robinson is the geographer at the Bureau of Northwest Territories and Yukon Affairs, Department of Mines and Resources, being in charge of the compiling and analysing of information on the Canadian Eastern Arctic. Last summer and fall Mr. Robinson travelled 6,000 miles through the Eastern Arctic gathering information, and at present is again doing field work in that region. (See also C. G. J. for September, 1943.)

Vladimir Obruchev, Member of the Academy of Sciences of the U.S.S.R. and author of "Geology in the U.S.S.R.", (which was sent to us from Moscow), is the doyen of Soviet geologists. Last October his eightieth birthday was widely celebrated in scientific circles, on which occasion he was awarded the Order of Lenin. Academician Obruchev is also a Cavalier of the Order of the Red Banner of Labour. His chief works are devoted to the geology of Siberia and Central Asia. He is the founder of the branch of geology which studies eternally frozen soil, and is the director of an institute established for the conduct of this study. In addition, Obruchev has written a number of popular scientific fantasies, the best known of which are *Plutonia* and *The Land of the Sannikovs*.

Nadine A. Deacon, whose article "Geographical Controls and Land Use in Toronto" appears in this month's issue of the Journal, received her B.A. degree at the University of Toronto in 1939, having been granted a Trinity College Arts Scholarship in 1938. In 1940 and '41, Mrs. Deacon was awarded The Canadian Geographical Society Fellowship in Geography, and in the latter year obtained her M.A. degree, following which she spent eight months as a member of the Society's staff at its Ottawa office. During the winter of 1943-'44, Mrs. Deacon engaged in research work for the Toronto City Planning Board. Two of her articles on geographical subjects have been published in the Ontario College of Education's *School* magazine.

R. C. Stevenson, author of "Canada's Sea Cadets" was born in Montreal and educated at St. Johns School, now Lower Canada College. He acts in a volunteer capacity as Co-ordinator of Sea Cadet Activities for Naval Services in Canada. His wide interest in Navy League affairs is further indicated as a past Vice-President of the Quebec Division of the Navy League, a member of the Executive and Chairman of the Financial Campaign, and of the Book and Magazine Committees of the Montreal Division. A keen yachtsman Mr. Stevenson holds membership in many Canadian Yacht clubs and is also a member of Lloyd's Yacht Club, London, England. At present he is Honorary Commodore and Chairman of the Finance Committee of the Royal St. Lawrence Yacht Club, Montreal, which club he has represented in numerous international and interclub races. Mr. Stevenson takes an active interest in the Boy Scouts Association occupying important offices in the Quebec Branch and is Chairman of the Dominion Executive Board of the Canadian General Council.

The Canadian Geographical Society

OTTAWA CANADA

The Society's ambition is to make itself a real force in advancing geographical knowledge, and in disseminating information on the geography, resources and people of Canada. In short, its aim is to make Canada better known to Canadians and to the rest of the world.

As one of its major activities in carrying out its purpose, the Society publishes a monthly magazine, the Canadian Geographical Journal, which is devoted to every phase of geography—historical, physical and economic—first of Canada, then of the British Empire and of the other parts of the world in which Canada has special interest. It is the intention to publish articles in this magazine that will be popular in character, easily read, well illustrated and educational to the young, as well as informative to the adult.

The Canadian Geographical Journal will be sent to each member of the Society in good standing. Membership in the Society is open to any one interested in geographical matters. The annual fee for membership is three dollars in Canada.

The Society has no political or other sectional associations, and is responsible only to its members. All money received is used in producing the Canadian Geographical Journal and in carrying on such other activities for the advancement of geographical knowledge as funds of the Society may permit.